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Emotions as context: Do the naturalistic effects of emotion regulation strategies depend on the regulated emotion?

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Abstract

Researchers have examined how several contexts impact the effectiveness of emotion regulation strategies. However, few have considered the emotion-to-be-regulated as a context of interest. Specific emotions are important contexts because they may require particular responses to internal and external stimuli for optimal regulation. Ninety-two undergraduates completed 10 days of ecological momentary assessment, reporting their current mood, recent emotions, and emotion regulation strategies three times per day. The frequency with which certain emotion regulation strategies were used (i.e., acceptance, positive refocusing, reappraisal, problem-solving, and other-blame) differed by the specific emotion experienced. Acceptance and positive refocusing were associated with better mood regardless of emotion, while substance use was associated with worse mood regardless of emotion. Reappraisal was associated with better mood in response to anger than anxiety or sadness, while emotional suppression and other-blame were associated with worse mood in response to anger. These results suggest some emotion regulation strategies exhibit emotion-invariant effects while others depend on the emotion-to-be-regulated.

Keywords

emotion regulation; emotion; context; flexibility; regulation strategies

Emotion regulation is the process by which a person attempts to "influence which emotions one has, when one has them, and how one experiences or expresses these emotions" (Gross, 1998). People may intentionally enact many emotion regulation strategies to influence an emotion. For example, when experiencing sadness, someone may reappraise the situation as an opportunity for growth or watch a funny movie to distract themselves.

Categorizing Emotion Regulation Strategies

Emotion regulation strategies have been categorized in different ways. One common *a priori* method is to categorize strategies as putatively adaptive or maladaptive (e.g., Aldao &

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Nolen-Hoeksema, 2012). Putatively adaptive strategies are thought to facilitate short- and long-term goals and would result in repairing a negative mood without interfering with a necessary task. Putatively adaptive strategies include acceptance, problem-solving, and reappraisal, among others. Putatively maladaptive strategies are thought to hinder a person's goals, particularly long-term goals, and include avoidance, emotional suppression, and rumination, among others.

Categorizing emotion regulation strategies this way assumes each strategy is similarly effective across contexts. There is some meta-analytic evidence for this assumption: avoidance, rumination, and suppression are more strongly associated with symptoms of psychopathology than the use of acceptance, reappraisal, and problem-solving (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Similarly, putatively adaptive strategies such as acceptance, reappraisal, and positive refocusing have been associated with better mood in the moment, while putatively maladaptive strategies such as self-blame and generalizing/catastrophizing have been associated with worse momentary mood (Heiy & Cheavens, 2014).

Alternatively, emotion regulation strategy effectiveness may depend on context (Lazarus & Folkman, 1984). For example, distracting oneself from acute sadness with a funny movie may be adaptive if it increases positive affect and interferes with rumination. However, distracting oneself from longer-lasting sadness may be maladaptive if it interferes with necessary problem-solving or prolongs the initial source of sadness. Various contexts influence emotion regulation strategy use and effectiveness, including the timing of emotion regulation strategy use during emotional experiences (e.g., Kalokerinos, Résibois, Leuven, Verduyn, & Kuppens, 2017), perceived controllability of a stressor (e.g., Haines et al., 2016), and situational goals (e.g., English, Lee, John, & Gross, 2017). However, few researchers have tested the contextual effects of emotions-to-be-regulated on emotion regulation strategy use or effectiveness, despite their seemingly central role in emotion regulation.

Frequency of Emotion Regulation Strategy Use

Researchers have found some evidence that the frequency of emotion regulation strategy use varies by emotion. For instance, when testing responses to vignettes designed to elicit fear, sadness, and anger, participants reported seeking more social support, being more passive and avoidant, but ruminating less in sadness-eliciting situations than those eliciting fear or anger (Zimmermann & Iwanski, 2014). Participants also reported using more expressive suppression in response to fear-eliciting situations and more putatively maladaptive regulation (e.g. other-blame) in response to anger-eliciting situations. In a separate vignette study, participants reported blaming others, ignoring their feelings, expressing their emotions, and leaving the situation more often in response to anger-eliciting situations than sadness-eliciting situations (Rivers, Brackett, Katulak, & Salovey, 2007). When describing personal experiences, participants reported using expressive suppression more often in sadness-eliciting situations than anger-eliciting situations (Dixon-Gordon, Aldao, & De Los Reyes, 2015).

It is noteworthy that in each of these studies, participants reported using some strategies no matter the emotional context. Zimmermann and Iwanski's (2014) participants reported using adaptive regulation (e.g., calming down; problem-solving) with similar frequency in response to sadness-, fear-, and anger-eliciting situations. Similarly, Rivers et al. (2007) found that participants reported using problem-solving, information gathering, non-verbal emotional expressions, and comfort-seeking/prayer with similar frequency in both sadness- and anger-eliciting situations. Finally, Dixon-Gordon et al. (2015) found that participants consistently used acceptance more often than self-criticism in both sadness- and anger-eliciting situations.

Taken together, these findings suggest the frequency with which some, but not all, emotion regulation strategies are used varies by the emotional context. Specifically, while problem-solving and acceptance may be consistently applied in different emotional contexts, blaming others, avoiding the situation, and seeking social support may be more tied to specific emotional experiences. While these findings offer a baseline understanding of the patterns with which emotion regulation strategies are used, they leave open the question of whether such strategies are effective at regulating emotions in these different emotional contexts.

Effectiveness of Emotion Regulation Strategy Use

The influence of emotional context on emotion regulation effectiveness varies widely, depending on the theory of emotion regulation considered. In the process model of emotion regulation (Gross, 2015), for instance, emotional awareness is thought to be a key component of successful emotion regulation. Accurately identifying one's emotion and connecting it to one's values is thought to prompt the effective selection and implementation of emotion regulation strategies (Gross, 2015). Although these steps seem to imply a process of matching emotion regulation strategies to the emotional context, the process model is relatively agnostic about which strategies would be most effective for which emotions.

In clinical psychology, several treatments are based on theories of effective emotion regulation. Dialectical Behavior Therapy (DBT; Linehan, 1993) is a third-wave psychological treatment for people who exhibit dysregulation across many emotions. This treatment explicitly outlines which emotion regulation strategies are most appropriate for which emotions (Linehan, 2015) based on basic and applied research. For instance, in response to sadness, clients are encouraged to engage in behavioral activation and mindfulness. In response to fear or anxiety, clients are taught to expose themselves to the feared stimulus. For all emotions, DBT therapists encourage clients to consider and, in many cases practice, cognitive reappraisal and problem-solving while abstaining from mood-altering substances.

In a meta-analysis of emotion regulation strategy effectiveness, strategies were relatively more effective when used to regulate sadness than anger, anxiety, or disgust, although specific studies produced more nuanced results (Webb, Miles, & Sheeran, 2012). For instance, cognitive reappraisal may be more effective at reducing anger and disgust than sadness and amusement (Demaree, Robinson, Pu, & Allen, 2006; Olatunji, Berg, & Zhao, 2017; Pasupathi, Wainryb, Mansfield, & Bourne, 2017), while both emotional suppression

and expressive suppression may be less effective at regulating pain in response to anger than anxiety (Quartana & Burns, 2007). Expressing emotions may be more useful in response to anger than sadness, while changing the situation may be less effective in regulating sadness than anger (Rivers et al., 2007).

Two aspects of this literature make it difficult to synthesize the findings. First, researchers have compared different pairs of emotions and emotion regulation strategies in nearly every study, making it difficult to generalize conclusions across studies. Second, researchers have primarily used standardized, impersonal emotional stimuli (e.g., emotion-inducing film clips or images) or recollections of past emotional experiences. While standardized, impersonal stimuli provide a consistent benchmark against which to compare responses, these designs necessarily exhibit lower external validity. Participants may expect the emotions induced in these studies to be relatively short-lived, compared to those experienced in their daily lives. On the other hand, studies in which participants are asked to recall situations that evoked particular emotions may be more externally valid, but may exhibit greater recall biases, depending on the timeframe from which the memories are drawn.

One design researchers have used to address these limitations is ecological momentary assessment (EMA). In EMA designs, participants report on their emotion regulation strategies and the context in which those strategies occur multiple times per day for several days. Although participants still self-report their emotion regulation efforts, these reports are recorded nearer in time to the emotion regulation behavior than in personal recollection designs. Further, EMA designs allow researchers to capture how participants regulate personally impactful and potentially longer-lasting emotions than the typical laboratory study. Although participants in EMA studies are almost always responding to idiographic stimuli, researchers can account for some of this variability by including relevant standardized measures of participants' response tendencies (e.g., Neuroticism) in analyses of EMA data.

Current Study

In the current study, we examined how a broad range of emotion regulation strategies related to mood in the context of discrete emotions in a secondary data analysis. Participants reported their mood, primary emotion experienced, and emotion regulation strategy use in an EMA design. This design allowed us to compare the frequency and effectiveness of strategies in response to multiple negatively-valenced emotions.

Based on the literature, we expected acceptance and problem-solving to be used with similar frequency regardless of the emotion experienced. We also expected other-blame and emotional suppression to be used more frequently in response to anger than anxiety or sadness. We expected some strategies to be effective regardless of the emotion experienced, while the effectiveness of others would depend on what emotion participants reported. Specifically, because acceptance and positive refocusing have been associated with improved emotional responding (Webb et al., 2012), we expected acceptance and positive refocusing to be effective independent of the emotion experienced. Because the effectiveness of reappraisal and emotional suppression has varied depending on how they were

implemented (Webb et al., 2012), we expected the effectiveness of reappraisal and emotional suppression to vary by emotion. Based on the research and theory underlying DBT, we expected behavioral activation to be more effective in response to sadness than anger or anxiety, while we expected substance use to be less effective regardless of emotion. Because the other emotion regulation strategies have not been as well-studied, we did not make specific predictions about the remaining strategies.

Method

Participants

Ninety-two undergraduate students (mean age = 19.73 years, *SD* = 2.25) from a large Midwestern university participated in exchange for course credit. The majority of the sample was female (54%) and Caucasian (81%). As described by Heiy and Cheavens (2014), participants were oversampled for those scoring higher in Neuroticism on the NEO Personality Inventory-Revised (Costa & McCrae, 1992), producing a sample slightly elevated in average Neuroticism scores (*M* = 103.69, *SD* = 28.59) and normally distributed on this measure.

Measures

NEO Personality Inventory-Revised, Neuroticism subscale (NEO-PI-R-N; Costa & McCrae, 1992).—The NEO-PI-R-N is a subscale of the NEO-PI-R (Costa & McCrae, 1992) consisting of 48 self-report items designed to assess Neuroticism, or the degree to which people report anxiety, hostility, depression, self-consciousness, impulsivity, and vulnerability to stress. Items are scored on a Likert-type scale from 0 (*strongly disagree*) to 4 (*strongly agree*) and exhibited excellent internal consistency in the current sample (Cronbach's alpha = .95).

Mood.—At the start of each assessment point, participants reported their current mood from 0 (*worst mood*) to 100 (*best mood*). In this sample, the average mood was 61.33 (*SD* = 20.82) and ranged from 0 to 99.

Specific negative emotions.—Participants then chose the strongest negative emotion experienced (if any) since the previous assessment from seven options: anger, anxiety, sadness, embarrassment, guilt, disgust, and loneliness. We only included ratings where participants identified anger, anxiety, or sadness as the primary emotion as these were the three most-endorsed negatively-valenced emotions (see Heiy & Cheavens, 2014). Participants reported one of these three emotions in 74.2% of negative emotion experiences.

Emotion regulation strategies.—Finally, participants selected all the emotion regulation strategies they used to decrease the intensity of their identified negative emotion from a list of 20 strategies presented in a random order. These strategies, derived from the emotion regulation literature, were described in plain English to facilitate participant understanding (e.g., "I thought about the situation in a different way" represented cognitive reappraisal). The full list of strategies is included in Tables S1 and S2 (https://osf.io/zxmtn).

Procedures

Informed consent was obtained from all participants. Participants were trained to use a Palm Pilot™ z22 personal device assistant (PDA) at an introductory session in the lab. Over the following ten days, participants completed all measures on the PDA. The PDA prompted participants for responses three times each day at random points within 4-hr typical waking time periods. These prompts typically occurred around 1:00 P.M., 5:00 P.M., and 9:00 P.M. All procedures were approved by the university Institutional Review Board.

Analytic Plan

Because participants reported on more strategies than most studies assess, we were concerned about inflating our Type I error rate. To address this concern and reduce the influence of our own biases on the selection of strategies, we conducted model selection using *proc glmselect* in SAS 9.4 to minimize overall model Akaike Information Criterion (AIC) using the Least Absolute Shrinkage and Selection Operator (LASSO; Tibshirani, 1996) method[1]. This process identified a subset of the initial 20 emotion regulation strategies to analyze.

We examined whether the frequency of use of each of the subset of emotion regulation strategies varied as a function of the primary emotion experienced. We calculated the observed total frequencies with which each strategy was used in response to anger, anxiety, and sadness. For each emotion regulation strategy, we compared these observed frequencies to the frequencies we would expect based on the proportion of total experiences of anger, anxiety, and sadness using chi-squared tests in the *chisq.test* function in R Version 3.4.1 (R Core Team, 2017).

Next, we examined associations among the emotion regulation strategies from the subset above. We calculated polychoric correlations among emotion regulation strategies and Pearson product-moment correlations between emotion regulation strategies and mood using the *cor.ci* function of the *psych* package (Revelle, 2018) in R Version 3.4.1 (R Core Team, 2017).

We used hierarchical linear modeling (HLM) to test the associations between emotion regulation strategy use and mood. We ran two HLM models. In the first, we tested which emotion regulation strategies were associated with mood regardless of the specific emotion experienced. We entered the subset of emotion regulation strategies as simultaneous predictors of mood at the same time point. Emotion regulation strategy use was coded such that 0 = emotion regulation strategy not used and 1 = emotion regulation strategy used. Because we oversampled participants higher in Neuroticism, we included grand-mean centered NEO-PI-R-N scores as a covariate. Due to the temporal nature of the data, we used

[1]This procedure identifies the best-fitting generalized linear regression model for the data based on user-defined criteria. We entered all 20 emotion regulation strategies as independent variables and mood at the same time point as the dependent variable. We ran *proc glmselect* with the LASSO method set to minimize the overall AIC to identify a data-driven subset of the initial 20 emotion regulation strategies to analyze. The LASSO method iteratively adds and deletes regression parameters such that the sum of the absolute value of the regression coefficients is constrained. Because of this constraint, parameters relatively close to zero may be shrunk to zero to provide more efficient model estimation that is not dependent on *p*-values. Models with all 20 strategies are provided in Table S1 (https://osf.io/zxmtn).

a first-order autoregressive covariance structure for the residuals. We also allowed the intercept of each participant to vary as a random effect. Finally, we used restricted maximum likelihood estimation and the Kenward-Roger method to calculate degrees of freedom with *proc mixed* in SAS 9.4.

In the second model, we tested whether specific negative emotions moderated the associations between emotion regulation strategy use and mood. Emotion type was dummy-coded by creating two variables: an anxiety indicator variable (i.e., 0 = anger, 1 = anxiety, 0 = sadness) and a sadness indicator variable (i.e., 0 = anger, 0 = anxiety, 1 = sadness). We then created dummy-coded variables to represent the product of each emotion regulation strategy used and each emotion indicator variable. We entered each emotion regulation strategy from the subset of strategies calculated above, the dummy-coded emotion indicator variables, and the products of the emotion regulation strategies and the dummy-coded emotion indicator variables as simultaneous predictors of mood at the same time point. To reduce the possibility of inflating our Type I error rate, we examined the Type III tests of fixed effects for each product of emotion regulation strategy and emotion indicator variables. The Type III tests are omnibus tests for each pair of emotion regulation strategy-emotion indicator product variables. A statistically significant Type III test indicates at least one association between emotion regulation strategy use and mood differs by the emotion experienced. We followed up significant Type III omnibus tests by examining the product terms of the pairs of dummy-coded variables. We again included grand-mean centered NEO-PI-R-N scores as a covariate; we used a first-order autoregressive covariance structure for the residuals; we allowed the intercept of each participant to vary as a random effect; we used restricted maximum likelihood model estimation; and we used the Kenward-Roger method to calculate degrees of freedom with *proc mixed* in SAS 9.4.

Results

After excluding occasions during which participants completed any response in less than 3 s, participants completed 1,966 out of a possible 2,760 responses (92 participants × 10 days × 3 occasions per day; 71.2%). Of these 1,966 responses, participants identified 557 events in which they experienced anger (n = 159), anxiety (n = 262), or sadness (n = 136) as the primary emotion. Participants failed to provide a mood rating in 30 of these events. Of the situations in which participants provided a mood rating, they reported the numerically highest mood on average after experiencing anxiety (M = 66.26, SD = 16.76) compared to anger (M = 58.13, SD = 23.35) and sadness (M = 55.63, SD = 22.56).

Using *proc glmselect*, we identified eleven emotion regulation strategies that demonstrated an optimal model fit when predicting current mood. These strategies included putatively adaptive strategies (i.e., positive refocusing, reappraisal), putatively maladaptive strategies (i.e., other-blame, generalizing, emotional suppression), cognitive strategies (i.e., problem-solving, consequences), behavioral strategies (i.e., behavioral activation, sleep, substance use), and an acceptance-based strategy (i.e., acceptance).

Next, we tested whether the frequency with which these 11 strategies were used varied by the emotion experienced (Table 1). The frequency with which acceptance, positive

refocusing, reappraisal, problem-solving, and other-blame were used differed by the emotion experienced, $\chi^2(2)$s > 7.00, *p*s < .05. Acceptance, $\chi^2(2) = 8.61$, $p = .01$, and problem-solving, $\chi^2(2) = 9.06$, $p = .01$, were used more frequently than expected in response to anxiety. Acceptance was used less frequently than expected in response to sadness; problem-solving was used less frequently than expected in response to anger. Positive refocusing, $\chi^2(2) = 7.27$, $p = .03$, and reappraisal, $\chi^2(2) = 9.32$, $p = .01$, were used more frequently than expected in response to sadness and less frequently in response to anger. Other-blame, $\chi^2(2) = 62.16$, $p < .01$, was used more frequently than expected in response to anger and less frequently in response to anxiety and sadness.

We then examined correlations among emotion regulation strategies and mood at any given occasion (Table 2). In general, putatively adaptive strategies were positively associated with each other and negatively associated with putatively maladaptive strategies. The largest associations between any pair of emotion regulation strategies were between consequences and generalizing, $r = .67$, $p < .01$, 95% CI [.58, .76], positive refocusing and reappraisal, $r = .43$, $p < .01$, 95% CI [.31, .55], and between generalizing and substance use, $r = .41$, $p < .01$, 95% CI [.25, .54], representing medium-to-large associations (Cohen, 1977). The correlations between emotion regulation strategy use and mood were generally smaller, with the largest positive association between acceptance and mood, $r = .27$, $p < .01$, 95% CI [.18, .34], and the largest negative association between generalizing and mood, $r = -.27$, $p < .01$, 95% CI [–.34, –.18], representing medium-sized associations (Cohen, 1977).

To examine which emotion regulation strategies were associated with mood regardless of emotion, we ran a single hierarchical linear regression in which we regressed current mood on all eleven emotion regulation strategies. Three strategies were significantly associated with current mood: acceptance, $B = 6.44$, $SE = 1.58$, $p < .01$, 95% CI [3.33, 9.55], positive refocusing, $B = 6.13$, $SE = 1.71$, $p < .01$, 95% CI [2.78, 9.49], and substance use, $B = -6.48$, $SE = 2.40$, $p = .01$, 95% CI [–11.19, –1.76] (Table 3)[2]. Acceptance and positive refocusing were associated with a significantly better mood when used than when not used regardless of emotion, while substance use was associated with a significantly worse mood when used than not across emotions.

Finally, we examined whether the associations between emotion regulation strategies and participants' current mood differed by the specific emotion experienced (Table 4). The Type III omnibus tests of the products of specific negative emotions and reappraisal, $F = 3.17$, $p = .04$, emotional suppression, $F = 3.69$, $p = .03$, and other-blame, $F = 3.69$, $p = .03$, were significant. When probing these interactions (Figure 1), reappraisal was associated with a significantly higher mood when used than not used in response to anger, $B = 9.87$, $SE = 3.48$, $p < .01$, 95% CI [3.04, 16.71], but was unrelated to mood in response to anxiety or sadness, *p*s > .95. Both emotional suppression, $B = -10.88$, $SE = 3.80$, $p < .01$, 95% CI [–18.34, –3.42], and other-blame, $B = -7.48$, $SE = 2.93$, $p = .01$, 95% [–13.24, –1.73], were associated with a significantly lower mood when used than not used in response to anger, but were unrelated to mood in response to anxiety or sadness, *p*s > .30.

[2]Beta weights indicate the unique difference in mood, on a 0–100 scale, when each strategy was used, relative to when it was not used.

Discussion

In this study, we assessed the frequency and effectiveness of a broad array of emotion regulation strategies used in response to three emotional experiences (i.e., anger, anxiety, and sadness) relatively common for most people, regardless of psychopathology. By examining such a broad array of strategies, our results may speak more comprehensively to how people along the full dimension of Neuroticism regulate emotions.

The frequency with which several emotion regulation strategies were used (i.e., acceptance, positive refocusing, reappraisal, problem-solving, and other-blame) varied by the primary emotion experienced. We expected acceptance and problem-solving to be used with similar frequency across emotions, while other-blame and emotional suppression would be used more frequently than expected in response to anger and anxiety, respectively. Instead, acceptance was used more frequently than expected in response to anxiety and less frequently in response to anger and sadness. Problem-solving was used more frequently than expected in response to anxiety and less frequently in response to anger. Other-blame was used more frequently than expected in response to anger than anxiety or sadness, but emotional suppression was used as frequently as expected across all three emotions. Absent a specific hypothesis, we also found that positive refocusing and reappraisal were used more frequently than expected in response to sadness and less frequently than expected in response to anger.

These results suggest that participants use acceptance and problem-solving in response to anxiety more often than sadness or anger. In nearly half of anxiety experiences (44.7%), participants reported using both acceptance and problem-solving, despite the opposing goals typically associated with these strategies (i.e., accepting vs. changing one's current situation). Because participants reported on their use of strategies since the previous assessment, they may have first accepted their anxiety and then tried to problem-solve the situation that prompted it (Nakamura & Orth, 2005). Future researchers should test this hypothesis by comparing the temporal dynamics of emotion regulation strategy use in response to discrete emotions.

Our results also suggest that reappraisal and positive refocusing were used more frequently than expected in response to sadness than anger. This pattern is supported by Beck's cognitive theory of depression (Beck, Rush, Shaw, & Emery, 1979), in which depression, characterized primarily by sadness, is most effectively reduced by changing one's thoughts about a situation. Given that sadness is less arousing than anger, it may be less effortful for people to use these cognitive strategies, perhaps resulting in increased use in response to sadness.

Relatedly, and as hypothesized, other-blame was used more frequently in response to anger than anxiety or sadness. Anger may result from a perceived transgression and people may be more likely to identify a transgressor when experiencing anger than anxiety or sadness.

Our main hypotheses regarding the effectiveness of acceptance, positive refocusing, and emotional suppression were generally supported, while our results provide novel information about the effects of substance use, other-blame, and reappraisal. Positive refocusing is

conceptually similar to distraction, which leads to improved mood when experiencing sadness (Joormann, Siemer, & Gotlib, 2007), anger (Rusting & Nolen-Hoeksema, 1998), and anxiety (Kalisch, Wiech, Herrmann, & Dolan, 2006). Similarly, acceptance has been consistently linked to improvements in emotional functioning (Webb et al., 2012). These studies all used experimental designs in which participants were presented with standardized stimuli for a limited time when it may be most recommended to distract oneself. In the current study, we further demonstrated that positive refocusing and acceptance may be beneficial even outside controlled laboratory settings in response to more personally relevant, longer-lasting, and/or naturalistic stressors. Evidence of these effects is important, particularly given the growing focus on the use of acceptance in psychotherapy (e.g., Unified Protocol; Barlow et al., 2018; Mindfulness-Based Cognitive Therapy; Segal, Williams, & Teasdale, 2012).

In contrast, substance use may often be used to avoid one's current emotions. Considerable research has linked "drinking to cope" with alcohol-related problems (Kuntsche, Knibbe, Gmel, & Engels, 2005) and substance use with greater experiential avoidance (Chawla & Ostafin, 2007). Further, substance use impacts several brain regions (e.g., the amygdala and prefrontal cortex) associated with emotion regulation (Gilman et al., 2014; Oscar-Berman & Marinkovic, 2004), suggesting that emotions may be exacerbated by substance use.

We found contextual effects for emotional suppression, other-blame, and reappraisal in response to anger compared to sadness and anxiety. Participants reportedly felt worse when suppressing anger but no different if they suppressed anxiety or sadness. This novel finding requires replication as anger suppression has been similarly correlated with daily experiences of anger, anxiety, and general distress (Martin & Watson, 1997). These researchers, however, did not directly compare the associations among emotional suppression and specific emotions.

Participants also reported worse mood when using other-blame in response to anger, but no difference in mood in response to anxiety or sadness. Blaming others when angry may exacerbate a poor mood by prolonging the experience of the emotion. Alternatively, when people are feeling worse and experiencing anger, they may simply be more likely to blame others. Because our study design does not allow inference into the mechanism or temporal ordering through which this happens, future research into the relation between other-blame and anger is warranted.

In contrast, participants reported a better mood when using reappraisal in response to anger, while reappraisal use was unrelated to mood in response to anxiety or sadness. This result was surprising, given that reappraisal was used less frequently than expected in response to anger. These results together may suggest that thinking about an anger-provoking situation differently is particularly helpful, although rarely used in practice. Because reappraisal was used less frequently in response to anger than anxiety or sadness, we may also have had less power to detect stable effects. We encourage the replication of this finding by future researchers.

A primary limitation of this study is the correlational design. Participants reported their mood after using emotion regulation strategies but not before, so we cannot definitively say whether the use of these strategies caused a change in mood. Further, it is possible that the mood reported at the time of assessment occurred up to two or three hours after the initial emotional experience, weakening the association between current mood and emotion regulation strategy use. This aspect of the study design also impedes our ability to interpret lagged analyses. We attempted to address this limitation by assessing participants frequently and randomly throughout their waking time and only testing associations between emotion regulation strategy use since the previous assessment and current mood, but future researchers may examine these relations using event-contingent responding to specific emotional experiences. Although participants may have felt multiple emotions in a given experience, we asked them to identify the most intense emotion experienced. This form of assessment sacrifices some detail regarding participants' experience, while allowing us to more clearly assess the strategies used in response to a primary emotion. Similarly, we did not behaviorally observe participants' use of any emotion regulation strategies; thus, we did not measure how well participants used each strategy. Future researchers may assess the degree to which a strategy is used (e.g., duration of use, accuracy of implementation). Finally, this sample was drawn from a university population, which may limit the generalizability of our results. However, because our sample was normally distributed on Neuroticism, we may expect these results to generalize to relatively healthy populations.

To our knowledge, this is the first EMA study to directly test whether emotion regulation strategy use and effectiveness depend on the emotion-to-be-regulated. The frequency with which some strategies were used (i.e., acceptance, positive refocusing, reappraisal, problem-solving, and other-blame) varied by the emotion experienced. The effectiveness of some strategies was relatively independent of emotional context (i.e., acceptance, positive refocusing, and substance use), while the effectiveness of others depended on the emotion experienced (i.e., reappraisal, emotional suppression, and other-blame). These findings suggest that acceptance and positive refocusing may be similarly associated with mood across different emotional experiences, while substance use may be linked with consistently lower moods across emotions. Our results suggest that some putatively maladaptive strategies, such as emotional suppression and other-blame, may be most concerning when used in response to anger, while reappraisal, although used less frequently in response to anger, may be particularly helpful. These findings also demonstrate the importance of assessing both frequency and effectiveness of emotion regulation strategy use as these results do not always align.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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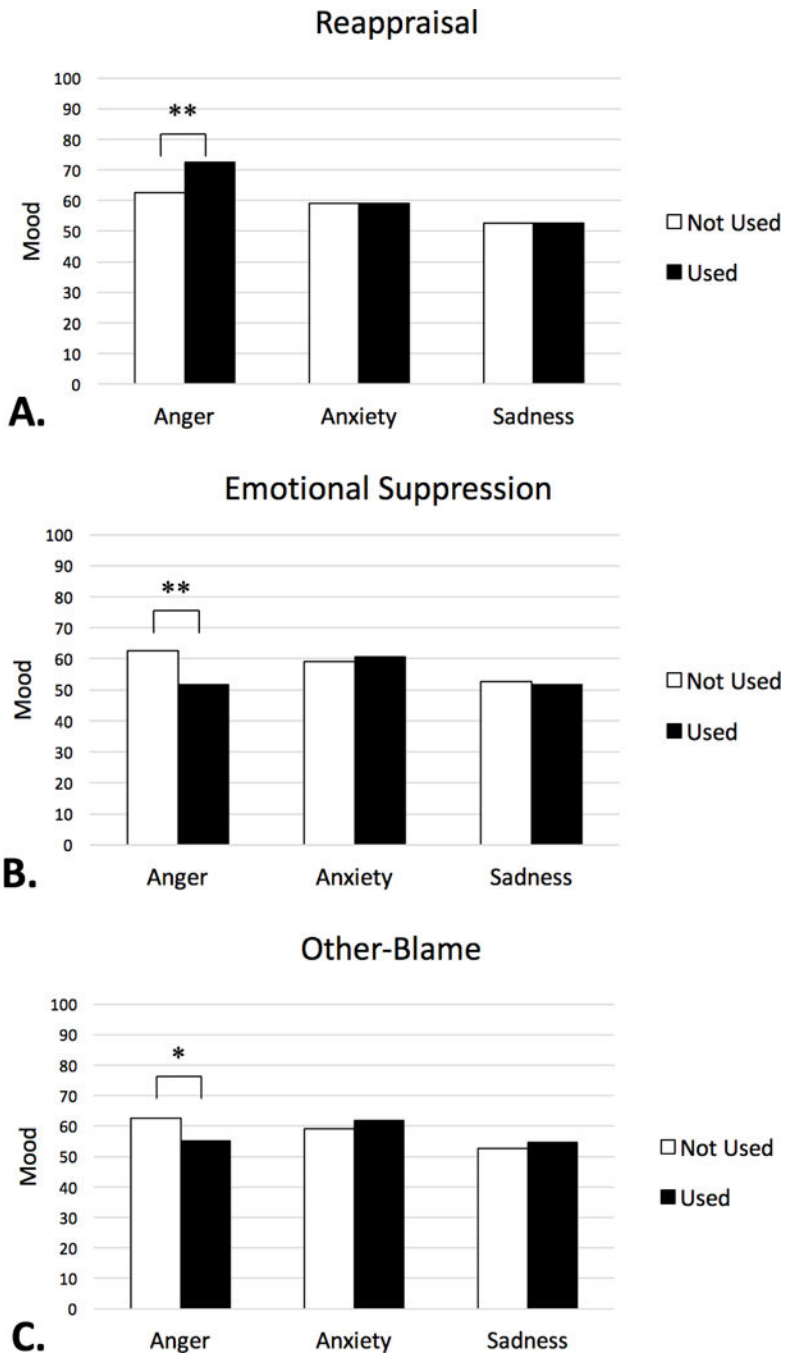

Figure 1.

A) The association between mood and the interaction of reappraisal with anger, anxiety, and sadness. B) The association between mood and the interaction of emotional suppression with anger, anxiety, and sadness. C) The association between mood and the interaction of other-blame with anger, anxiety, and sadness. ** $p < .01$ * $p < .05$

Table 1.

Observed vs. expected frequencies of strategy use by emotion type

	Anger		Anxiety		Sadness				
Emotion Regulation Strategy	**Observed**	**Expected**	**Observed**	**Expected**	**Observed**	**Expected**	χ^2	*df*	*p*
Acceptance	76	94.8	182	156.2	74	81.1	8.61	2	.01
Positive Refocusing	33	47.4	82	78.1	51	40.5	7.27	2	.03
Reappraisal	32	44.8	72	73.8	53	38.3	9.32	2	.01
Problem-Solving	59	79.4	153	130.8	66	67.9	9.06	2	.01
Behavioral Activation	82	87.9	151	144.9	75	75.2	.66	2	.72
Sleep	29	36.3	56	59.7	42	31.0	5.58	2	.06
Consequences	60	67.9	107	111.9	71	58.1	4.01	2	.14
Emotional Suppression	24	29.7	57	48.9	23	25.4	2.65	2	.27
Other-Blame	105	55.9	52	92.2	39	47.9	62.16	2	< .01
Generalizing	63	60.5	84	99.7	65	51.8	5.97	2	.05
Substance Use	29	25.7	38	42.3	23	22.0	.92	2	.63
Total Emotion Observations	159		262		136				

Table 2.

Correlations among emotion regulation strategy use and mood

Emotion Regulation Strategy	Frequency of Use *n* (%)	1	2	3	4	5	6	7	8	9	10	11
1. Acceptance	332 (60.3%)											
2. Positive Refocusing	166 (30.1%)	.34**										
3. Reappraisal	157 (28.5%)	.29**	.43**									
4. Problem-Solving	278 (50.5%)	.36**	.24**	.33**								
5. Behavioral Activation	308 (55.9%)	.30**	.29**	.22**	.21**							
6. Sleep	127 (23.0%)	.04	.08	.01	.03	< .01						
7. Consequences	238 (43.2%)	−.12	−.06	.20**	.09	.02	.03					
8. Emotional Suppression	104 (18.9%)	.09	.27**	.12	.06	.10	.09	−.14				
9. Other-Blame	196 (35.6%)	−.22**	−.01	.05	−.23**	.08	−.15	.22**	−.04			
10. Generalizing	212 (38.5%)	−.11	−.03	.28**	.07	.13	.02	.67**	.02	.34**		
11. Substance Use	90 (16.3%)	−.10	−.13	.15	−.06	−.08	.27**	.35**	.13	.32**	.41**	
12. Mood	61.33 (20.82)†	.27**	.17**	.07	.13**	.10*	−.10*	−.18**	−.05	−.13**	−.27**	−.21**

Note. Correlations among emotion regulation strategies are polychoric correlations because these variables are binary (0 = not used, 1 = used). Correlations between emotion regulation strategies and mood are Pearson product-moment correlations because mood is continuous (0–100). Frequency of use indicates the number of times each strategy was reported by any participant across all occasions. Percentages do not add to 100 because participants could report the use of multiple strategies at any given occasion.

† *M* (*SD*).

* $p < .05$,

** $p < .01$.

Table 3.

Hierarchical linear regression of the associations between emotion regulation strategy use and mood

Independent Variable	*B*	*SE*	*t*	*p*	95% CI
Intercept	58.24	2.40	24.24	< .01	[53.51, 62.97]
Acceptance	6.44	1.58	4.07	< .01	[3.33, 9.55]
"I accepted the situation and/or my emotions."					
Positive Refocusing	6.13	1.71	3.59	< .01	[2.78, 9.49]
"I thought of something pleasant instead of what had happened."					
Reappraisal	1.73	1.71	1.01	.31	[−1.64, 5.10]
"I thought about the situation in a different way."					
Problem-Solving	.76	1.57	.48	.63	[−2.33, 3.84]
"I made a plan to make the situation better."					
Behavioral Activation	.55	1.53	.36	.72	[−2.45, 3.55]
"I found an activity to keep myself busy and distracted."					
Sleep	−1.11	1.79	−.62	.53	[−4.63, 2.41]
"I went to sleep."					
Consequences	−1.90	1.65	−1.15	.25	[−5.14, 1.35]
"I thought about all the different things in my life that this situation would impact."					
Emotional Suppression	−1.91	1.97	−.97	.33	[−5.78, 1.97]
"I ignored my feelings."					
Other-Blame	−2.70	1.64	−1.64	.10	[−5.93, .53]
"I thought about how the situation was someone else's fault."					
Generalizing	−2.86	1.79	−1.59	.11	[−6.39, .67]
"I thought about all the other things that have happened to me in addition to this."					
Substance Use	−6.48	2.40	−2.70	.01	[−11.19, −1.76]
"I smoked a cigarette/drank alcohol/got high."					
Neuroticism	−.06	.06	−1.10	.28	[−.18, .05]

Note. Neuroticism scores are grand-mean centered. Model AIC = 4266.80.

Table 4.

Hierarchical linear regression of the associations between emotion regulation strategy use × negative emotions and mood

Independent Variable	*B*	*SE*	*t/F*	*p*	95% CI
Intercept	62.56	3.35	18.70	< .01	[55.98, 69.13]
Acceptance	7.46	2.59	2.88	< .01	[2.37, 12.55]
Positive Refocusing	10.16	3.46	2.93	< .01	[3.35, 16.96]
Reappraisal	9.87	3.48	2.84	< .01	[3.04, 16.71]
Problem-Solving	1.24	2.75	.45	.65	[−4.16, 6.64]
Behavioral Activation	−3.43	2.74	−1.25	.21	[−8.82, 1.95]
Sleep	−4.27	3.41	−1.25	.21	[−10.96, 2.43]
Consequences	−4.34	3.01	−1.44	.15	[−10.27, 1.58]
Emotional Suppression	−10.88	3.80	−2.87	< .01	[−18.34, −3.42]
Other-Blame	−7.48	2.93	−2.56	.01	[−13.24, −1.73]
Generalizing	−7.89	3.20	−2.47	.01	[−14.17, −1.61]
Substance Use	−5.12	4.25	−1.20	.23	[−13.48, 3.23]
Neuroticism	−.05	.06	−.86	.39	[−.17, .07]
Negative Emotions (NE)			2.37	.10	
Anxiety	−3.36	4.09	−.82	.41	[−11.40, 4.67]
Sadness	−9.89	4.57	−2.16	.03	[−18.88, −.91]
Acceptance × NE			.66	.52	
Acceptance × Anxiety	−3.46	3.45	−1.00	.32	[−10.24, 3.32]
Acceptance × Sadness	.20	4.04	.05	.96	[−7.74, 8.14]
Positive Refocusing × NE			.69	.50	
Positive Refocusing × Anxiety	−4.80	4.18	−1.15	.25	[−13.01, 3.40]
Positive Refocusing × Sadness	−4.04	4.57	−.88	.38	[−13.03, 4.94]
Reappraisal × NE			3.17	.04	
Reappraisal × Anxiety	−9.98	4.24	−2.35	.02	[−18.32, −1.64]
Reappraisal × Sadness	−10.01	4.68	−2.14	.03	[−19.21, −.82]
Problem-Solving × NE			.02	.98	
Problem-Solving × Anxiety	−.63	3.43	−.19	.85	[−7.37, 6.10]
Problem-Solving × Sadness	−.59	4.06	−.15	.88	[−8.56, 7.38]
Behavioral Activation × NE			1.46	.23	
Behavioral Activation × Anxiety	4.06	3.42	1.18	.24	[−2.67, 10.79]
Behavioral Activation × Sadness	6.58	3.92	1.68	.09	[−1.13, 14.29]
Sleep × NE			1.03	.36	
Sleep × Anxiety	4.68	4.12	1.13	.26	[−3.43, 12.78]
Sleep × Sadness	6.22	4.54	1.37	.17	[−2.70, 15.14]
Consequences × NE			.45	.63	
Consequences × Anxiety	3.51	3.75	.93	.35	[−3.87, 10.88]
Consequences × Sadness	1.49	4.40	.34	.73	[−7.15, 10.14]
Emotional Suppression × NE			3.69	.03	

Independent Variable	*B*	*SE*	*t/F*	*p*	95% CI
Emotional Suppression × Anxiety	12.20	4.54	2.69	.01	[3.28, 21.12]
Emotional Suppression × Sadness	9.86	5.24	1.88	.06	[−.44, 20.17]
Other-Blame × NE			3.69	.03	
Other-Blame × Anxiety	10.11	3.98	2.54	.01	[2.29, 17.93]
Other-Blame × Sadness	9.55	4.58	2.09	.04	[.56, 18.55]
Generalizing × NE			2.47	.09	
Generalizing × Anxiety	8.71	3.92	2.22	.03	[1.00, 16.42]
Generalizing × Sadness	5.16	4.62	1.12	.27	[−3.93, 14.25]
Substance Use × NE			1.35	.26	
Substance Use × Anxiety	1.65	5.08	.32	.75	[−8.34, 11.63]
Substance Use × Sadness	−6.83	5.54	−1.23	.22	[−17.72, 4.06]

Note. Negative emotions consist of anger, anxiety, and sadness. *F*-statistics reported for variables including NE; *t*-statistics reported for all other variables. Variables including Anxiety (or Sadness) are interpreted as the average mood reported when the given emotion regulation strategy is used in response to anxiety (or sadness) relative to the average mood reported when the given emotion regulation strategy is used in response to anger. Neuroticism scores are grand-mean centered. Model AIC = 4107.20.