Emotion regulation strategy use in response to daily stressors among college students: an experience sampling study

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Acknowledgements: We would like to thank Julia Chavez and Isabel Polletta for their help with data collection. This work was supported by faculty startup funds from Worcester Polytechnic Institute and a grant from the German Research Foundation (grant number GRK 2988/1).

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Abstract

Emotion regulation strategies play a critical role in helping people manage stressors and maintain psychological well-being. Understanding the efficacy and boundary conditions of regulatory strategies—as they are implemented in response to stressors in daily life—is especially important for college-aged students, a population that has been experiencing chronically high levels of depression and anxiety in recent years. Here, we utilized ecological momentary assessment (EMA) to capture college students' use of multiple emotion regulation strategies in response to idiosyncratic, real-world stressors, as well as the effects of strategy use on momentary stress levels and momentary affect. Following a preregistered analytic plan, we first combined two EMA samples from Rice University and Bard College (N=159) to examine effects of strategy use on momentary affect. We also investigated the influence of factors that could interact with strategy use, namely momentary fluctuations in mental exhaustion and people's general propensity to experience distress in the first place. Some results were consistent with our preregistered, *a priori* hypotheses, with rumination negatively associated with momentary affect, but use of other strategies did not significantly predict changes in momentary affect. Contrary to our predictions, efficacy of reappraisal slightly increased at higher levels of mental exhaustion. Exploratory analyses revealed that the number of adaptive strategies positively predicted momentary affect and the number of maladaptive strategies negatively predicted momentary affect. Overall, this study contributes to the growing body of research on the variable effects of emotion regulation strategies in real-world contexts. Our findings also speak to the dynamic interplay between strategy type/tactic, situational factors, and individual characteristics to drive changes in momentary affect.

Key words: Emotion regulation, real world stressors, process model, EMA, college students

Emotion regulation describes the ability to alter our emotional experiences (e.g., duration, occurrence, intensity) and expressions in response to an emotion-eliciting event (Gross & Thompson, 2007). Emotion regulation can occur consciously or unconsciously and it is essential to everyday functioning (Braunstein et al., 2017; Cohen & Ochsner, 2018). Indeed, research has found that emotion regulation plays an important role in emotional and physical well-being, as well as social and physiological functioning (Aldao et al., 2010; Gross, 1998; Gross & John, 2003; Lopez et al., 2024). Specifically, adaptive emotion regulation is associated with reductions in negative affect, stress, and inflammation, and increased positive affect, health behaviors, and life satisfaction (DeSteno et al., 2013; Gross & John, 2003; Lopez & Denny, 2019).

Given this well-established connection between emotion regulation and health, it is no surprise that research in emotion regulation and its strategies continues to expand. This research has illuminated the dynamic relationship between emotion regulation strategies (e.g., distraction, reappraisal), contextual features, and the characteristics of the individual regulating emotions on adaptive outcomes (Doré et al., 2016; Wilms et al., 2020). Therefore, the main goal of the present study was to investigate naturalistic interactions between a range of emotion regulation strategies and stressors (i.e., context) and how they impact real world affective experiences.

The need to regulate emotions effectively is ubiquitous across all populations, and especially so among those that are stressed or vulnerable. Although college-aged individuals are often reflected in samples that address questions relevant to emotion regulation because they represent an easy to reach population for researchers (Petersen & Merunka, 2014), they represent a crucial population for affective science due to the critical impact the transition to college has on an individual's identity formation and the emergence of affective disorder diagnoses, such as

depression and anxiety, in this age group of students in their early 20s (Lijster et al., 2017; Zisook et al., 2007). It is critical to assess emotion regulation in college-aged individuals in order to better understand how to mitigate maladaptive outcomes and support healthier well-being during this formative period.

The Process Model of Emotion Regulation

The process model of emotion regulation provides a useful framework for understanding the different stages at which emotions are generated and can be regulated (Gross, 1998). According to the model, emotions can be regulated along four stages of the emotion generative process to alter the emotional impact. Distraction is a commonly studied attentional deployment strategy which entails disengaging from a situation or stimulus by thinking of unrelated or neutral things (Sheppes et al., 2011; Wolgast & Lundh, 2017). Cognitive change strategies involve varying appraisals, or interpretations of an emotion-eliciting event (Gross, 1998). The most studied cognitive change strategy is cognitive reappraisal, which is intended changes the meaning associated with an emotion-eliciting situation in ways that alter one's emotional response (Ford & Troy, 2019; Goldin et al., 2008). This strategy is believed to be more effortful compared to other strategies (e.g. distraction), but it has been associated with a wide range of mental, emotional, and physiological outcomes (Aldao et al., 2010; Appleton et al., 2013).

Distraction has also been shown to down-regulate negative affect relatively quickly (Thiruchselvam et al., 2011; Webb et al., 2012). In one study with depressed and non-depressed groups, distraction led to shortened depressed moods in the depressed group compared to those who used rumination, a consistently maladaptive strategy characterized by repetitively focusing on one's distressing emotions, the symptoms, and the cause and consequences of the distress, that is associated with depression, negative affect, stress, and other psychopathologies (Goodson

et al., 2023; Nolen-Hoeksema & Wisco, 2008; Rosenbaum et al., 2022). Notably, distraction is often selected over reappraisal in high-intensity situations, because it allows a person to disengage from the stimulus (Sheppes et al., 2011, 2014). Similarly, cognitive reappraisal is effective at down-regulating negative affect and upregulating positive affect (Gross & John, 2003; McRae et al., 2012). Cognitive reappraisal is also associated with better mental health and reductions in inflammation in the body (Appleton et al., 2011; Hu et al., 2014). Compared to distraction, cognitive reappraisal is preferred in less intense situations, when meaning can be easily changed without expending excessive emotional or cognitive effort (Sheppes & Meiran, 2008). Finally, response modulation strategies intervene on different aspects of the emotional response once it is experienced. For example, expressive suppression is a frequently studied emotion regulation strategy and entails the inhibition of outward emotional expression (Gross & Levenson, 1993). In contrast with cognitive reappraisal, expressive suppression is often associated with less desirable outcomes (Cutuli, 2014; Gross & John, 2003; Gross & Levenson, 1993). It is often associated with less positive affect, little to no reductions in negative affect, and worse mental well-being (Butler et al., 2003; Hu et al., 2014).

Adaptive vs. maladaptive emotion regulation strategies

Although the efficacy of a given regulatory strategy depends on features of the situation and the person using it (Bonanno & Burton, 2013), certain strategies do tend to be associated with more adaptive outcomes, and others with more maladaptive outcomes (Aldao et al., 2010; Aldao & Nolen-Hoeksema, 2010, Webb et al., 2012). Many widely studied emotion regulation strategies shape the attentional focus or appraisal of events—processes that have short-term implications for the experience of emotion as well as longer-term implications, including associations with the onset of depression and other forms of psychopathology (Beck, 2008;

Sheppes et al., 2015). For example, distraction and rumination are both attentional strategies, but involve directing one's attention away from and towards the stressor, respectively. Distraction can be effective for promoting down-regulation of negative emotions in the short-term, especially in high-intensity emotional situations (Gross et al., 2015; Webb et al., 2012; Sheppes et al., 2011) while rumination, which involves dwelling on one's negative thoughts and emotions, is associated with increased negative emotions and the onset of depression over time (Aldao, McLaughlin & Nolen-Hoeksema, 2011). While distraction can provide immediate relief by directing attention away from stressors, reappraisal modulates the emotional impact of the situation in the short-term and over time by changing its meaning (Gross, 1998; 2015; Sheppes et al., 2015). Suppression is also widely associated with poorer regulatory outcomes, particularly among Western samples (Webb et al., 2012). Given widespread patterns from both experimental (Webb et al., 2012) and ESM and daily diary studies (Boemo et al., 2022) we conceptualized distraction and reappraisal as adaptive strategies that would improve momentary affect, whereas we treated rumination and suppression as maladaptive strategies that would worsen momentary affect.

Quantity and quality of use of multiple strategies (polyregulation)

Polyregulation refers to an individual's use of multiple regulatory strategies to manage their emotions around a single stressor (Ford et al., 2019). Some prior work indicates that employing multiple strategies during a regulatory episode predicts better regulatory outcomes in various domains (Lopez et al., 2021; Werner et al., 2025; Heiy & Cheavens, 2014). However, emerging literature suggests that considering not only the number of strategies a person uses, but also their quality, is critical for predicting regulatory outcomes (Aldao & Nolen-Hoeksema, 2013; Baldwin et al., 2025; Grommisch et al., 2020; Ladis et al., 2023; Southward & Cheavans,

2020). Because of this, in the present study we conducted exploratory analyses (see details below in the Method) examining potential effects of polyregulation on momentary affect with adaptive and maladaptive strategies, respectively.

Boundary conditions of emotion regulation strategy use

Successful emotion regulation depends on more than just labeling strategies as adaptive or maladaptive. Emerging research emphasizes the interplay between strategy factors, situational contexts, and individual characteristics (Doré et al., 2016). For instance, strategy preference varies with situational intensity, with distraction favored in high-intensity scenarios, while cognitive reappraisal is more common in lower-intensity ones (Sheppes et al., 2008; Webb et al., 2012; Wylie et al., 2023). Mental exhaustion also can influence strategy choice, as it impairs cognitive control, making less demanding strategies like distraction preferable over cognitively taxing ones like reappraisal (Grillon et al., 2015; Lewczuk et al., 2022). Additionally, person factors such as culture, emotional beliefs, and trait anxiety further shape emotion regulation (Butler et al., 2007; Ford & Gross, 2019; Aguirre et al., 2024; Daros et al., 2019). This complexity underscores the need to systematically evaluate when and for whom specific strategies are effective. Boundary conditions refer to any moderating factors that can enhance or diminish effects of interest. Here, we examined boundary conditions when predicting participants' implementation of various regulatory strategies as well as predicting effects of strategy efficacy on momentary affect. Specifically, with respect to strategy selection, the present study focuses on momentary mental exhaustion and individual differences in perceived stress as boundary conditions of strategy use. We investigate them further as boundary conditions of strategy efficacy by treating them as moderators of associations between strategy use and momentary affect.

Moving emotion regulation research beyond the lab

Another key consideration is whether lab-based findings translate to real world contexts that require emotion regulation. Ecological momentary assessments (EMA), daily diaries, and other experience sampling methods allow researchers to examine emotion regulation processes in naturalistic settings (Brans et al., 2013; Nezlek & Kuppens, 2008; Richardson, 2017). While some studies support lab-based findings, such as stress intensity influencing strategy use (Goodson et al., 2023; Wylie et al., 2023), others reveal significant variability in daily contexts and within-person strategy use (English et al., 2017; Verduyn et al., 2009).

Although research has expanded into naturalistic assessments of strategy use, few studies have included measurements of subtactics within a given strategy. In the case of cognitive reappraisal, there are two important subtactics: reinterpretation (changing the meaning of a situation) and psychological distancing (adopting an objective, third-person perspective) (Denny & Ochsner, 2014; McRae et al., 2012). These subtactics differentially impact negative affect and stress over time and also engage distinct neural markers (Denny et al., 2023; Denny & Ochsner, 2014; McRae et al., 2012). Since most research uses the broad term "cognitive reappraisal," further investigation into subtactics is essential to better understand strategy efficacy and boundaries, especially in naturalistic settings.

The Present Study

Although there have been some EMA studies testing strategy effectiveness among college students (e.g., Daros et al., 2019), we wanted to replicate and extend these findings with an *a priori* distinction between more and less adaptive strategies given the makeup of strategies assessed in the present sample. Moreover, there have been few EMA studies directly testing the relative efficacy of reappraisal tactics, especially given that previous research suggests tactics

can give rise to different behavioral and neural outcomes (e.g., McRae et al., 2012; Denny et al., 2023). Next, given that recent emotion regulation theorizing has evolved to take into account the joint influence of person, situation, and strategy factors (e.g., see Denny, 2020; Doré et al., 2016), we also wanted to test specific boundary conditions of strategy efficacy, namely: a strategy-by-situation interaction to examine the moderating influence of momentary exhaustion and a person-by-strategy interaction examining the moderating role of people's general tendency to experience distress.

Thus, to address these aims, we had four *a priori*, pre-registered hypotheses about the effectiveness of each strategy/tactic (Hypotheses 1 and 2) and the boundary conditions of strategy efficacy (Hypotheses 3 and 4). Specifically, we hypothesized that: strategies frequently shown to be adaptive, namely distraction and cognitive reappraisal, will be associated with higher ratings of state affect compared to typically less adaptive strategies, namely expressive suppression and rumination (H1). Next, regarding specific cognitive reappraisal tactics, we hypothesized that psychological distancing will be relatively more effective than reinterpretation at reducing momentary unhappiness (H2). With respect to boundary conditions of strategy use, in moments when participants are experiencing greater mental exhaustion, they will be less likely to employ more cognitively effortful emotion regulation strategies (i.e., reinterpretation and distancing), and when they do employ such strategies, they will be less effective than in moments when they report being less mentally exhausted (H3). Additionally, those participants who tend to generally experience more distress will use emotion regulation strategies more frequently and/or when they employ less adaptive strategies, those strategies will not be as effective at reducing momentary unhappiness (H4).

To test these hypotheses, we conducted pre-registered analyses in a combined sample made up of two sub-samples of college students from two institutions, where participants' experiences and regulation of daily stressors were assessed via EMA for one week.

Method

Participants

All participants were undergraduate students recruited from the campuses of Rice University and Bard College, respectively. In total, there were 159 participants (69.81%Women; M_{age}= 19.16 years, SD_{age}= 1.04 years, n_{Rice} = 109, n_{Bard} = 50). Participants in the Rice sample received a brief training in either cognitive reappraisal or distraction. The training consisted of an introduction to a specific strategy, followed by a quiz in which participants were given plausible scenarios in which they could apply the strategy in daily life (all training materials and analyses examining training effects can be found in the online supplementary online material [anonymous link]). Participants in the Bard sample received no training in any strategy. There were similar demographic characteristics across the two samples (see Table 1 below), but given patterns of missing data as described below, six participants were excluded from analysis, yielding a final sample size of N = 153.[1]

All participants gave informed consent in accordance with the Institutional Review Boards of Rice University and Bard College, respectively, with Rice students receiving course credit for their participation and Bard students receiving monetary compensation ($20 per hour, prorated).

EMA Procedure and Measures (both samples)

All measures administered during the EMA portion of the study were nearly identical across the two samples. The EMA protocol was adapted from prior work (Lopez et al., 2021,

[1]See supplementary online materials for sample size and statistical power considerations

2014). Participants completed a weeklong experience sampling procedure that consisted of 4-5 EMA pings randomly administered throughout the day. For each ping, participants were first queried about whether they were experiencing stress currently or recently (in the past 20 minutes): "*Are you currently feeling stressed, or have you felt stressed within the last 20 minutes (and/or since the last text message you received)*?"

If they responded with "yes" to feeling stressed currently or recently, they were then asked: "*Did you use any of the following strategies to make yourself feel differently (e.g., less negative) about whatever was causing you distress? Check as many that apply*." Response options included: "*Told myself a story / reinterpreted what I was feeling to make myself feel differently*" (reappraisal-by-reinterpretation); "*Distracted myself by thinking about something completely unrelated*" (attentional deployment-distraction); "*Dwelling on what I was feeling*" (*rumination*); "*Put the situation in a broader perspective and reminded myself that things like this happen*" (reappraisal-by-distancing); "*Holding what I was feeling inside and trying not to show anyone what I was feeling*" (expressive suppression); and to assess other, idiosyncratic strategies not captured by the other options, there was an open-ended response in the Bard sample. Strategies were dummy coded "1" if used and "0" if not used.

Next, there were three questions assessing different aspects of strategy use: perceived success of implementing the strategies ("*In general, how successful would you say you were implementing the strategies you indicated above?*" rated on a slider scale from 0-100, where 0 = not at all successful and 100 = very successful); perceived ease of implementing the strategies ("*In general, how easy did you find it was implementing the strategies you indicated above?*" rated on a slider scale from 0-100, where 0 = not at all easy (difficult) and 100 = very easy); and perceived strategy utility for future use ("*If faced with this stressor again in the future, how likely*

is it that you would use the same strategies you indicated above?" rated on a slider scale from 0-100, where 0 = not at all likely and 100 = very likely).

For each EMA ping, regardless of whether stress (and attendant regulatory strategies) were reported, we assessed momentary levels of stress and overall affect, respectively: "*Generally, how stressed are you right now?*" (rated on a slider scale from 0-100, where 0 = not at all stressed, 50 = moderately stressed, and 100 = very stressed); and *"Generally, how happy do you feel right now?*" (rated on a bi-valent scale from -50 to 50, where -50 = very unhappy, 0 = neutral, and 50 = very happy).

Analytic Approach

Primary Analyses

First, as shown below in Table 1 and Table 2, we computed descriptive statistics indicating the following (across both samples and all EMA observations): Frequency and proportions of participants experiencing a stressor (or not); frequencies and proportions of strategy use (overall); and (perceived) ease and success of implementation, and utility of using the employed strategies. Next, and as indicated in our OSF preregistration, many of our proposed analyses involved combining data from the Bard and Rice samples to increase statistical power and examine overall efficacy of multiple regulatory strategies.

Specifically, we fit two sets of multilevel models to test our a priori hypotheses using the subset of the EMA data when participants reported a current or recently experienced stressor. The first set of models tested hypotheses about strategy efficacy (H1 and H2) and the second set of models tested hypotheses about the boundary conditions of strategy use and efficacy (H3 and H4). The primary outcome measure in these models were participants' momentary experiences of affect, with a focus on affect as the outcome and stress as a covariate, following modeling

approaches in recent emotion regulation studies that employed EMA (Nook et al., 2021). In the interest of transparency and thoroughness, we will run a companion set of models with stress as the outcome and affect as a covariate and report those results in the supplementary online materials.

In all models, we included the following preregistered person-level variables as covariates: sample (i.e., Rice versus Bard sample; dichotomous variable); participants' gender, to control for gender-related emotion regulation effects (Webb et al., 2012); and Perceived Stress Scores from the Perceived Stress Scale (Cohen et al., 1994), to control for potential individual differences in overall propensity to experience distress and negative affect. Additionally, with models with strategy use as the outcome, perceived stress scores, sample (Rice vs. Bard) and participants' gender were included as covariates. Unless otherwise noted, all Level 1 (within-person) predictors were person-mean centered and all Level 2 (between-person) predictors were grand-mean centered.

Exploratory Analyses

In addition to the primary analyses described above and as per our preregistration, we also carried out exploratory analyses. First, regarding polyregulation, we had initially preregistered an exploratory model investigating the efficacy of polyregulation by using the total number of strategies employed during an emotion-eliciting episode as a mediator of the relationship between stress and affect. To obtain more precise insight into how combining different types of strategies may influence momentary affect, we proceeded to test a different exploratory model, with the total number of adaptive strategies and total number of maladaptive strategies used during the stressor, as separate predictors in the same model, with momentary affect as the outcome.

Next, we fit lagged (vs. concurrent) models predicting momentary affect using the same model specifications as the primary analyses, but instead these lagged models predicted time *t* outcomes using time *t* - 1 measures of interest, while controlling for time *t* - 1 values of the outcome and other covariates (see supplementary online materials for results)

Statement of Transparency

In the interest of transparency, we would like to note several deviations from our preregistration. First, data for other idiosyncratic strategies was available only for the Bard subsample. As including this variable as a predictor in models for hypothesis 1 and 2 would drastically reduce the sample size for those models, we ran the models for these hypotheses twice, once without including other idiosyncratic strategies, and another model including this variable as a predictor. Next, for the exploratory analyses that we preregistered for polyregulation, we report results from a modified model with momentary stress at time *t* - 1 as predictor, number of strategies at time *t* as the mediator, and momentary affect at time *t* as the outcome. This ensures that the predictor and the mediator are temporally preceding the outcome.

Results

After combining the data from the Rice and Bard subsamples, we had data from 159 participants. As mentioned above, six participants from Rice had missing data for L2 covariates. We therefore excluded these 6 participants from the analyses, leading to a final sample size of 153.

Summary Statistics

The means, standard deviations, counts, and frequencies for Level 1 (L1, within persons) and Level 2 (L2, between persons) variables are presented in Table 1 and Table 2. Overall, participants responded to 16.4 surveys over a 7 day period. On average, participants from Bard

responded to 19 surveys (out of a possible 28 surveys; 54.3%), and participants from Rice responded to 15.2 surveys (out of a possible 30 surveys; 57.1%).

Frequencies of stressors and strategy use

Participants reported feeling stressed or having felt stressed within the previous 20 minutes on 34.2% of the measured occasions. Most commonly encountered stressors were academic/career related (64.7%), followed by interpersonal (18.5%) and extracurricular/clubs/committees (6%). When faced with a stressor, participants reported using at least one strategy on 99.7% of those occasions. On occasions where participants reported a stressor, the most frequently used strategy was distancing (42.8%), followed by distraction (33.1%) and rumination (23.2%). See Table 1 for all frequencies.

Primary Analyses

We ran all multilevel models with random intercepts for participants, and added random slope terms if the model successfully converged and led to a better model fit (i.e., lower AIC). Momentary affect, mental exhaustion, and stress were rescaled to range from -5 to 5, 0 to 10, 0 to 10, respectively, to avoid convergence issues. Complete results from all models, including those that were able to be run with random slopes, can be found in the supplementary online materials.

Hypothesis 1: Strategy efficacy

We investigated the efficacy of each strategy (L1) while controlling for the use of other strategies (L1), momentary stress (L1), perceived stress score (L2), gender (L2), and training status (L2). Following our preregistration we hypothesized that, in general, strategies that are frequently assumed to be adaptive (i.e., distraction and cognitive reappraisal) would be more effective, relatively speaking, whereas strategies that are frequently regarded less adaptive (i.e., suppression and rumination) would be less effective or backfire, indicated by weaker positive or

even negative associations with momentary affect. These strategies were entered as predictors in the same model (for each strategy: 1= strategy used, 0= strategy not used).We found partial support for this hypothesis. Using rumination was negatively associated with momentary affect, $b = -0.63$, 95% CI [-0.92, -0.34], $t = -4.25$, $p < .001$, as expected. Neither distraction ($b = 0.20$, 95% CI [-0.08, 0.47], $t = 1.41$, $p = .158$), reappraisal ($b = 0.24$, 95% CI [-0.04, 0.51], $t = 1.70$, $p = .089$) or suppression ($b = -0.30$, 95% CI [-0.65, 0.04], $t = -1.75$, $p = .081$) were significantly related to momentary affect. Descriptively, distraction and reappraisal were positively and suppression negatively related to momentary affect.

Hypothesis 2: Distancing versus reinterpretation

To compare the two cognitive reappraisal tactics, distancing and reinterpretation, we ran the same model as for hypothesis 1, but instead of the conjoint reappraisal variable (reflecting whether at least one of the two reappraisal tactics was used), we entered distancing and reinterpretation as separate predictors. We predicted that distancing would be more effective than reinterpretation. In contrast to hypothesis 2, neither distancing ($b = 0.15$, 95% CI [-0.12, 0.41], $t = 1.07$, $p = .285$), nor reinterpretation ($b = 0.17$, 95% CI [-0.20, 0.53], $t = 0.90$, $p = .370$), was significantly associated with momentary affect (see Table S1 in supplementary online materials).

Hypothesis 3: Strategy-by-situation interaction

In order to investigate the boundary conditions of strategy efficacy, we tested mental exhaustion as a situational factor that could influence the use and efficacy of strategies. We hypothesized that individuals would be less likely to employ strategies that are commonly regarded as cognitively effortful, such as reappraisal, in situations when they are mentally exhausted (H3a), and when they do employ such strategies, they would be less effective than in situations when they are not as mentally exhausted (H3b). In contrast to hypothesis 3a, mental

exhaustion did not significantly predict the use of the conjoint strategy reappraisal (*OR* = 0.96, 95% CI [0.87, 1.05], *t* = -0.88, *p* = .380), nor the separate strategies of reinterpretation (*OR* = 0.94, 95% CI [0.81, 1.08], *t* = -0.94, *p* = .347), and distancing (*OR* = 0.98, 95% CI [0.89, 1.07], *t* = -0.51, *p* = .608). Mental exhaustion was also not significantly associated with using any of the other strategies (see Table S2 for full results).

Hypothesis 3b assumed that cognitively effortful strategies would be less adaptive when people are mentally exhausted. To test this, we examined the interaction between strategies and mental exhaustion to predict momentary affect. Mental exhaustion significantly moderated the association of reappraisal with momentary affect (*b* = 0.16, 95% CI [0.01, 0.31], *t* = 2.16, *p* = .031). Contrary to what was expected, at higher (versus lower) levels of mental exhaustion, momentary affect was *higher* during reappraisal (Figure 1). While not commonly regarded as a cognitively effortful strategy, the efficacy of distraction also slightly increased at higher levels of mental exhaustion compared to lower levels (*b* = 0.15, 95% CI [0.01, 0.29], *t* = 2.08, *p* = .038, Figure 2). There was no significant interaction between mental exhaustion and any other strategy.

Hypothesis 4: Person-by-strategy interaction

As a person-level contextual factor, we tested the individual propensity for experiencing distress (as measured by the Perceived Stress Scale [PSS]) as a moderator that could influence the use and efficacy of strategies. We hypothesized that those participants who generally experience more distress would use emotion regulation strategies more frequently (H4a) and/or when they employ more adaptive strategies, they will not be as effective as for participants typically experiencing lower levels of stress (H4b). Contrary to hypothesis 4a, PSS scores significantly predicted *lesser* use of reappraisal (*OR* = 0.95, 95% CI [0.92, 0.99], *t* = -2.37, *p* =

.018) and distancing (*OR* = 0.95, 95% CI [0.91, 0.99], *t* = -2.51, *p* = .012), although the effect sizes were small. PSS was not significantly associated with the use of any other strategy (see Table S3 for full results). To test hypothesis 4b, we examined whether PSS scores would moderate the associations between strategy use and momentary affect. The predicted interaction was not significant for any of the strategies (see Table S4 for full results).

Exploratory analyses

Polyregulation (adaptive and maladaptive strategies)

We preregistered to examine potential effects of polyregulation. In mediation models, we planned to test whether the number of employed strategies would mediate an effect of stress on affect. After consideration, we refrained from testing this idea because our measure of momentary stress allowed us to only assess stress *after* the strategies had been employed and presumably lowered stress. Consistent with our original reasoning, we instead ran a lagged analysis in which we examined a potential mediating effect of the number employed strategies for the effect of $stress_{t-1}$ on $affect_t$, but did not find such an effect (see Table S6 for full results).

Further testing potential effects of polyregulation, we distinguished between typically adaptive and maladaptive strategies. The primary analyses revealed that typically adaptive strategies (i.e., distraction, distancing, reinterpretation) tended to be adaptive also in the present data and vice versa for typically maladaptive strategies (i.e., rumination, suppression). Therefore, we tested another exploratory model with the total number of adaptive strategies and total number of maladaptive strategies employed during the episode, as separate predictors in the same model, with momentary affect as the outcome (not-preregistered), while controlling for momentary stress, gender, PSS scores and training status. We found that the number of adaptive strategies employed was positively associated with momentary affect (*b* = 0.21, 95% CI [0.00,

0.41], $t = 2.00$, $p = .046$), whereas the number of maladaptive strategies employed was negatively associated with momentary affect ($b = -0.54$, 95% CI [-0.77, -0.30], $t = -4.53$, $p = .001$). This suggests that for both adaptive and maladaptive strategies polyregulation was effective, albeit with opposing consequences for participants' momentary affect.

Discussion

In the present study, we conducted preregistered analyses to examine the efficacy and boundary conditions of emotion regulation strategies college students employ in response to idiosyncratic stressors experienced in daily life. Consistent with our *a priori* hypotheses (H1), we found that when participants engaged in rumination, they tended to report reductions in momentary affect. However, there were no significant associations between use of any other strategies and momentary affect, and when comparing two reappraisal tactics (i.e., distancing and reinterpretation; H2) no tactic was more effective than the other

We also tested the impact of situational and individual factors that could predict strategy use and moderate its efficacy, namely: mental exhaustion (H3) and participants' propensity to experience distress (H4). Momentary levels of mental exhaustion did not predict greater or less use of any strategies overall, but we observed an interaction effect whereby reappraisal was associated with increases in momentary affect, but only in those cases when participants reported higher levels of mental exhaustion (Sheppes et al., 2014). With respect to participants' varying tendency to experience distress, higher PSS scores were associated with lower use of reappraisal and distancing, suggesting those with higher perceived stress are less likely to access and implement otherwise adaptive strategies (cf. Aldao et al., 2010).

Our findings confirm previous work demonstrating negative associations between rumination and momentary affect. However, distraction, reappraisal, and suppression did not significantly predict momentary affect. Given that the coefficients for these strategies are in line with the expected positive and negative effects, one reason for not finding significant associations could be the relatively lower EMA response we observed, which could have resulted in fewer opportunities for participants to report using other, less frequent preferred strategies than rumination (e.g., suppression). It is also possible that the time window between the emotion episode and measurement was too broad to capture the influence of these strategies. Future studies should consider higher incentives for a higher response rate, and reduce the time window between subsequent pings for capturing the fluctuations in the outcomes more closely. Another possibility is that multiple strategies become crucial in navigating stressors in the real world (Baldwin et al., 2025). This aligns with our exploratory findings where the number of adaptive and maladaptive strategies predicted momentary affect. This further emphasizes the importance of considering both quantity and quality of strategies used in the face of daily stressors.

When investigating the boundary conditions of strategy efficacy, interestingly, mental exhaustion slightly improved the efficacy of reappraisal and distraction, contrary to our expectations. As reappraisal is generally regarded as a cognitively effortful strategy, we expected that when individuals are mentally exhausted, they would be less likely to use such strategies, and when they do employ them, they would be less effective in altering momentary affect. However, as affect was also negatively associated with mental exhaustion, it is possible that starting off with a more negative momentary affective state increased self-monitoring and led participants to be more predisposed to strategy use. For the improved efficacy of distraction, a plausible explanation is that, as it is not as cognitively effortful of a strategy compared to other

strategies, individuals would be able to employ it effectively despite being exhausted. Moreover, when individuals are exhausted, they may experience a shift in motivation impacting use and downstream efficacy of regulatory strategies (Inzlicht et al., 2014; Inzlicht & Schmeichel, 2012). In this case, the moderation effect we observed with distraction makes sense; it is considered less effortful compared to reappraisal, and we found that its efficacy slightly improved at higher levels of mental exhaustion. Interestingly, the moderating influence of mental exhaustion when people implemented reappraisal, a more effortful strategy, is in the opposite direction of what would be predicted by Inzlicht and Schmeichel's (2012; 2014) framework, with improved efficacy at higher levels of mental exhaustion. However, the effect sizes in these models were modest and further studies are needed to confirm these findings. Future research may also benefit from investigating motivational shifts accompanying fatigue and exhaustion, that may result in varying efficacies of regulatory strategies. These findings emphasize the importance of having multiple strategies in the repertoire, especially for populations that could be more prone to mental exhaustion and burn out, such as college students and working professionals (Aldao et al., 2010).

Another notable finding was that PSS scores predicted less use of reappraisal, particularly distancing. Although the effect sizes were small, this finding could be indicative of a lack of adaptive strategies in the repertoire of individuals with a higher propensity to experience distress. It might help to focus interventions on enriching the strategy repertoire of individuals with higher PSS scores by introducing more adaptive strategies. Contrary to expectations, PSS scores did not moderate strategy efficacy. This indicates that maladaptive strategies may be as harmful for individuals with lower propensity for distress as for individuals with higher propensity for

distress. This further highlights the need for having a greater number of adaptive strategies in one's repertoire.

That said, perhaps the most interesting results were those from some of the exploratory analyses that suggest that the quality of the strategies, together with the quantity of strategies employed, significantly predicted momentary affect. While the literature so far recognizes that the size of the repertoire of strategies is important (Gross, 2015), our exploratory findings indicate that the size of the repertoire can in fact be harmful if individuals have a higher number of maladaptive strategies to pick from and employ those in response to stressors (Aldao et al., 2010). However, when it comes to adaptive strategies, the larger the strategy repertoire, the more favorable the outcome (Sheppes et al., 2014). This may be particularly relevant for a population such as college students who are especially prone to stressors and developing affective disorders.

Moreover, our data shows that college students might have a more restricted repertoire. Participants in our study used multiple strategies only 25.7% of the time. They may want to overcome the stressors, but because of a restricted repertoire, any efforts at regulating their affect may only lead to worse outcomes if they end up employing maladaptive strategies. However, future research is needed to confirm these findings and extend them further by assessing a greater number (and combinations) of adaptive and maladaptive strategies and various outcomes. We must also note that the majority of our sample were women. Gender is known to influence the use of specific strategies, and while we controlled for it, future studies may also benefit from exploring the use and boundary conditions of these strategies for different genders (García-Fernández et al. 2025; Matthews et al., 2021; Nolen-Hoeksema, 2012).

Despite the contributions this study makes to the study of emotion regulation processes in real world contexts, there are several limitations worth noting. First, response rates throughout

the EMA portion of the study were not as high as EMA studies tend to be (Wrzus & Neubauer, 2023). This could be due to several reasons, but future studies employing a similar design could consider adding additional incentives (e.g., bonus payments for completing a certain percentage of surveys) to increase compliance. Next, the EMA sampling rate we employed (i.e., 4 or 5 EMA pings each day) may not have been sensitive enough to capture additional, more nuanced fluctuations in momentary affect, so it is possible some strategies assessed here may be variably effective depending on the time scale and timing between observations (Shiffman et al., 2008).

And although not all of our hypotheses were supported, especially those regarding the role and efficacy of individual strategies, it raises important questions about theorizing about emotion regulation, especially the process model of emotion regulation (Gross, 2015). For example, it is possible that overall predictions about strategy efficacy may not be universally and robustly supported in real world settings, where a host of other situational and person factors likely combine and interact in complex ways to drive changes in momentary affect (Sheppes et al., 2014). Indeed, some of the findings we believe are most notable from the present study reflect interaction effects and/or other ways to characterize strategy use beyond efficacy of individual strategies, such as the interplay between person factors, strategy repertoire, and polyregulation involving deployment of adaptive or maladaptive strategies (Aldao et al., 2010). We recommend that future studies take similar approaches to uncover additional boundary conditions, which could reveal additional nuanced effects of strategy use.

To conclude, some findings in the present study supported our *a priori* hypotheses, indicating that certain regulatory strategies, such as rumination, are maladaptive (as indexed by decreases in momentary affect). Our study also highlights the importance of considering situation factors, namely mental exhaustion, and person factors, such as propensity to experience distress,

when examining links between strategy use and affect. Moreover, exploratory analyses of polyregulation suggest that there are divergent effects of the number of adaptive and maladaptive strategies, respectively, on affective states in daily life. If this pattern is replicated and extended in future studies, it underscores how one should take into account both the quantity *and* quality of strategies used to improve predictions of successful emotion regulation in real world contexts

It is also worth noting that all results reported here were observed in college students---a population experiencing elevated risk for mental health challenges and for whom effective emotion regulation strategies are particularly critical for promoting well-being and resilience during a pivotal developmental period. Our findings highlight the importance for enriching the emotion regulation strategy repertoire of college students with more adaptive strategies, so they do not wittingly or unwittingly rely on maladaptive strategies (exclusively) when faced with stressors. Additionally, training college students to respond to stressors by flexibly applying various adaptive strategies from the repertoire might help promote well-being. However, it is important to note that the findings in our study are correlational. Further studies that experimentally manipulate the situational factors and the use of strategies are needed to establish stronger evidence for the efficacies of various strategies in different situations. In addition to implications for improving mental health in young people, we hope that this work meaningfully contributes to the growing body of translational research on emotion regulation and its applications across both basic and applied fields of study in psychological science.

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