Emotion Regulation as a Determinant of Recovery Experiences and Well-Being: A Day-Level Study

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This study examined the impact of two emotion regulation strategies, reappraisal and expressive suppression, on recovery experiences and affective well-being after significant study-related events. In a sample of 63 undergraduate students who completed a time-contingent daily diary over 14 consecutive days (726 diary entries), the assumption that perceived emotional stress during study-related events would reduce affective well-being at bedtime ($\beta = -0.28$, $p < .001$) was supported. Multilevel analyses further showed that recovery experiences partially mediated this negative relationship ($\beta = 0.39$, $p < .001$). As postulated, reappraisal buffered the adverse effects of emotional stress on recovery experiences ($\beta = 0.05$, $p < .01$). Unexpectedly, expressive suppression had the same buffering effect ($\beta = 0.04$, $p < .05$). We conclude that an additional, fine-grained focus on context and time would usefully enhance our knowledge of the effects of emotion regulation on stress responses.

Keywords: diary study, emotion regulation, well-being, recovery

After stressful events, people need time to recover to restore their resources (Meijman & Mulder, 1998). Accordingly, recent evidence shows that recovery experiences are positively related to different measures of psychological well-being (e.g., Geurts & Sonnentag, 2006; Hahn, Binnewies, Sonnentag, & Mojza, 2011; Sonnentag, 2003; Sonnentag & Fritz, 2007). However, while studies indicate that high work demands
increase the risk of not being able to relax after work (Cropley & Purvis, 2003; Rau, 2006; Sonnentag & Bayer, 2005), the follow-up question remains largely unanswered (for an exception, see, e.g., Sonnentag & Kruel, 2006): Which determinants impede or facilitate recovery experiences after demanding and stressful days? To ground practical advice (e.g., for stress management training design) on empirical evidence, we need to identify the processes that influence recovery experiences after stressful days.

One process that may explain recovery from job stress is emotion regulation. The Job Demands-Resources model (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001) predicts that personal resources moderate the consequences of job demands (Bakker & Demerouti, 2007; Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2007). In line with this prediction, research shows that individual differences in emotion regulation affect the way work-related emotional events relate to individual well-being and performance. For example, studies by Ciarrochi, Dean, and Anderson (2002) and by Giardini and Frese (2006) indicate that emotionally competent people who actively address emotional job stressors do have less adverse health effects later. Raftery and Bizer (2009) found that negative feedback enhanced test performance of individuals who habitually reinterpreted (i.e., reappraised) situations (“reapraisers”), but did not affect test performance of individuals suppressing the expression of their feelings (“suppressors”). Schraub, Stegmaier, and Sonntag (2011) showed that changes at their workplace did not affect suppressors’ well-being. Extending this line of individual differences research, we examine the impact of emotion regulation as a determinant of students’ recovery from emotional stress during study-related events.

Altogether, our aim in this study is to integrate research lines on work stress, recovery, and emotion regulation. First, we examine the role of recovery experiences in the relationship between emotional stress during study-related events and later affective well-being. Second, we investigate the impact of two different emotion regulation strategies on the relationship between emotional stress and recovery experiences. To our knowledge, the role of emotion regulation has not yet been analyzed with regard to the recovery process. Third, we further extend research on emotion regulation by analyzing situational emotion regulation behavior in a diary design. This design allows for detection of the effects of intrapersonal variation in the use of specific emotion regulation strategies, while controlling for individual differences in emotion regulation. To our knowledge, situational emotion regulation has so far only been analyzed in the emotional labor context (i.e., a context where emotions need to be regulated as part of one’s job; Hochschild, 1983); for example, in customer service (e.g., Totterdell & Holman, 2003).
THEORETICAL BACKGROUND AND HYPOTHESES
DEVELOPMENT

Effects of Emotional Stress on Recovery Experiences and Subsequent Affective Well-Being

Emotional stress is characterized by negative emotional experiences, such as anger or anxiety (Chang, Johnson, & Yang, 2007). According to the Person–Environment fit perspective (cf. Edwards, Caplan, & Harrison, 1998), it indicates a lack of match (i.e., a mis-fit) between environmental demands or supplies and a person’s abilities or needs. Emotional stress can lead to a variety of negative consequences for individuals’ well-being, attitudes, and behaviors (cf. Fisher & Ashkanasy, 2000; Fredrickson & Joiner, 2002; Weiss &Cropanzano, 1996). Previous studies have shown that events at work that are being perceived as stressful are negatively related to affective well-being (Elfering et al., 2005). If an emotional event at work is furthermore being perceived as significant, the likelihood increases that its effects spill over into leisure time (e.g., Williams & Alliger, 1994). In the present study we conceptualize the perceived stressfulness of a study-related event as “an individual’s response to work-related environmental stressors” (Jex, Beehr, & Roberts, 1992, p. 623).

As proposed by Conservation of Resources theory (Hobfoll, 1989), people strive to protect and accumulate resources to deal with their environment. Being a means to regenerate depleted resources (cf. Sonnentag, Perrewé, & Ganster, 2009), recovery experiences should help people to restore affective well-being and associated personal resources such as optimism after periods of emotional stress. People experience recovery by refraining from any activities involving effort expenditure so that resources can be rebuilt (Hobfoll, 1998; Meijman & Mulder, 1998) or by actively engaging in recovery activities which foster new resources (Geurts & Sonnentag, 2006; Hobfoll, 1998; Sonnentag, 2001). Sonnentag and Fritz (2007) identified distinct recovery experiences that promote recovery. One of them is psychological detachment, defined as an “individual’s sense of being away from the work situation” (Etzion, Eden, & Lapidot, 1998, p. 579). Another recovery experience is relaxation, which is “characterized by decreased sympathetic activation and becomes evident in a decrease in heart rate, muscle tension, and other indicators of activation” (Sonnentag, Binnewies, & Mojza, 2008, p. 675). Recent research demonstrates that resource-providing activities promote the recovery experiences psychological detachment and relaxation which in turn are positively associated with well-being and with feeling recovered (Ragsdale, Beehr, Grebner, & Han, 2011).
Several diary studies highlight the importance of adequate recovery experiences for well-being (cf. Demerouti, Bakker, Geurts, & Taris, 2009). Nevertheless, these studies also indicate that especially when resources are spent (e.g., because of high job demands), the risk of insufficient recovery after work increases (Cropley & Purvis, 2003; Rau, 2006; Sonnentag & Bayer, 2005). One reason for this effect may be prolonged cognitive engagement (i.e., lack of psychological detachment), which is a likely reaction to emotional stress (cf. Geurts & Sonnentag, 2006). Thus, it seems that recovery experiences are often impeded at precisely the times when they are most needed.

According to stress theories such as the Person–Environment Fit perspective (cf. Edwards, Caplan, & Harrison, 1998) and the Conservation of Resources theory (Hobfoll, 1989), we expect that emotional stress during significant study-related events negatively impacts people’s affective well-being at bedtime, which serves as an indicator of feeling recovered (Sonnentag, 2001). As recovery experiences during afterwork hours restore lost resources and positively affect peoples’ well-being (Demerouti et al., 2009), we further hypothesize that recovery experiences mediate the negative effects of emotional stress on affective well-being. Thus, we formulated the following hypotheses:

**Hypothesis 1:** Emotional stress during a significant study-related event negatively affects affective well-being at bedtime.

**Hypothesis 2:** Recovery experiences mediate the negative relationship between emotional stress during a significant study-related event and affective well-being at bedtime.

**Emotion Regulation as a Moderator of the Effects of Emotional Strain**

Emotion regulation refers to people’s efforts to influence the experience, intensity, duration, or expression of activated emotions during emotionally distressing events (Gross, 1998b). Gross (2001) developed a process-oriented model of emotion regulation to classify the strategies people use to regulate their emotions, and distinguished between antecedent-focused regulation and response-focused regulation. Antecedent-focused regulation (e.g., cognitive reappraisal of the situation) comes early in the emotion-generative process. Response-focused regulation (e.g., expressive suppression) is applied when emotions are already fully experienced and only modifies the emotional display, not the experience. Researchers ascribed to and empirically found quite diverse effects for these different types of emotion regulation.
Expressive suppression, on the one hand, is an ineffective strategy in terms of altering emotional experiences. It decreases the emotional expression, but not the intensity of the felt emotion (Gross, 2001; cf. Gross & John, 2003). Because of the cognitive load that the suppression of emotional expression imposes, expressive suppression is associated with impaired memory and social functioning. Various experimental studies demonstrated this effect. Richards and Gross (1999, 2000), for example, found that study participants who were asked to suppress emotional expressions during the presentation of emotion-eliciting material showed decreased incidental memory for information presented during the suppression period and increased cardiovascular activation. Schmeichel, Vohs, and Baumeister (2003) revealed that after a required suppression period, study participants performed demanding logical tasks significantly worse than a control group. Johns, Inzlicht, and Schmader (2008) revealed a similar effect for spontaneous expressive suppression: Study participants who suppressed the expression of negative emotions performed worse on tests of cognitive ability afterward. As a study by Butler and colleagues (2003) shows, restricted cognitive capacity because expressive suppression does not only affect mere cognitive tasks, but also translates to being less responsive in social interactions. Expressive suppression is further associated with negative long-term outcomes. People who frequently suppress their emotional expression apparently experience less positive and more negative emotions and have lower cognitive capacity as well as worse cardiovascular functioning (Richards, 2004; Srivastava, Tamir, McGonigal, John, & Gross, 2009). A longitudinal study showed that suppressors had weaker social connections at the end of college (English, John, Srivastava, & Gross, 2012). They also reported more depressive symptoms, were less satisfied with their lives and relationships, and were more pessimistic about their future (Gross & John, 2003).

Reappraisal, on the other hand, is an effective emotion regulation strategy, because it occurs very early in the emotion generative process and then even prevents the development of negative emotions (Gross, 2002). Thus, it imposes a much smaller cognitive load than expressive suppression, because it does not consume cognitive capacity to monitor one’s feelings and behavior later on (Gross, 2002; Richards & Gross, 2000). Accordingly, reappraisal does not negatively influence cognitive performance. For example, it did not decrease memory when people were asked to reappraise the situation while viewing emotional slides (Richards & Gross, 2000). In contrast to expressive suppression, reappraisal does not impair interpersonal communication (Butler et al., 2003). It is associated with positive long-term outcomes on health, memory, and social relationships (English et al., 2012; Gross & John, 2003; Richards & Gross, 2000; Srivastava et al., 2009).

Reviewing the emotion regulation literature, we found that with few exceptions (e.g., Tschan, Rochat, & Zapf, 2005), most empirical studies
published so far were either experimental (e.g., Gross, 1998a), analyzed individual differences (e.g., Ciarrochi et al., 2002; Giardini & Frese, 2006; Raftery & Bizer, 2009; Schraub et al., 2011), or focused on emotional labor (e.g., Totterdell & Holman, 2003). However, in environments where display rules are weaker and more informal than they are in the service context (cf. Bono & Vey, 2005), people may determine for themselves when and how to regulate their emotions. Moreover, theories on interpersonal effects of emotion regulation (Côté, 2005; Van Kleef, 2009) and the independence of emotion regulation styles suggest that people may apply different and sometimes concurrent emotion regulation strategies depending on the context. To both complement and extend prior studies, we therefore chose to examine situational regulation efforts instead of individual differences in this diary study. We adapted an emotion regulation questionnaire to situational regulation to gain insight into short-term consequences of specific emotion regulation behavior.

Concerning the effects of emotion regulation, we argue that the strategy of reappraising the situation might buffer negative effects of emotional stress on recovery experiences because it is applied early in the emotion-generative process and changes peoples’ interpretations of the respective situation (Gross, 2001). Reappraisal changes the emotional experience to being more positive, making subsequent regulation efforts unnecessary. Thus, resources are not bound for further self-control. We hypothesize that:

**Hypothesis 3:** Reappraisal buffers the negative impact of emotional stress on recovery experiences.

In contrast, researchers relate expressive suppression to mainly negative outcomes because it does not change the experience of emotional stress, but only suppresses its display, thereby consuming cognitive resources that otherwise would be available for other tasks (Raftery & Bizer, 2009). Because of this heightened cognitive load, we expect this regulation strategy to interfere with recovery experiences and hypothesize that:

**Hypothesis 4:** Expressive suppression enhances the negative impact of emotional stress on recovery experiences.

To summarize, we expect recovery experiences to be an explanatory mechanism for a negative relationship between emotional stress during study-related events and affective well-being at bedtime. Moreover, we deem the use of reappraisal and expressive suppression to differentially affect the relationship between emotional stress and recovery experiences. The framework that integrates the research questions is depicted in Figure 1.
METHOD

Contextual Factors

This diary study was conducted with undergraduate students of a German university who belonged to the first year of students in a reorganized curriculum (i.e., bachelor/master programs replacing a diploma curriculum). All students had received excellent grades in their final high school exams. Facing so far unstandardized processes, first-year students often reported insecurity regarding curriculum requirements and examination procedures. Because they knew that they would eventually have to apply and compete for a place in a master’s program to obtain an academic degree that would qualify them for the jobs they desired, they also experienced some pressure concerning their future careers. In addition, growing international competition and the implementation of tuition in Germany contributed to make studying a full-time job with a high stress level (Cooke, Bewick, Barkham, Bradley, & Audin, 2006; Obergfell & Schmidt, 2010).

Apart from classes at university, students need to self-determine their time and resources for their studies. According to the literature, recovery becomes even more difficult in an unregulated work–life situation (Ahrentzen, 1990; Copley, Dijk, & Stanley, 2006; Sonnentag & Kruel, 2006). Although a student’s life may differ from an employee’s life concerning the amount of work hours, it is important to note that their average level of stress and strain may not necessarily differ from an employee’s level. Recent studies show that students experience high levels of stressors and strains (e.g., Obergfell & Schmidt, 2010) and as Ragsdale and colleagues (2011) put it, “stress processes with a weekly cycle occur with students as well” (p. 154). In the final questionnaire of the diary, several participants reported that they had experienced the diary as a great opportunity to reflect on their study-related and private experiences and to become aware of certain behavior tendencies.
Sample and Procedure

In return for research participation credits required by their schedule, 67 full-time undergraduate students of a German university volunteered to participate in the study. All of them completed a paper-and-pencil questionnaire containing questions about demographics and personal traits. They then received a structured paper-based diary within which they had to answer a 1-page questionnaire each night before going to bed on 14 consecutive days. The research assistants reminded participants of this task each night via short messages on their cell phones. They were assured of anonymous data treatment, and that their cell phone numbers could not be assigned to their data. The research assistants also pointed out that they could be contacted in case of any questions or issues. We matched questionnaires by an individual, self-generated code.

Out of the 67 diaries that had been distributed, 65 were returned; this equals a return rate of 97%. Because two participants had to be excluded because of being on holiday while participating in the study, the final sample consisted of 63 participants (51 women and 12 men) with an average age of 21 years ($SD = 2.9$ years). All were full-time students, working on study assignments for between 3 and 12 hr per day, with an average working time of 4.8 hr per day ($SD = 2.1$).

Measures

The focus study variables emotional stress, recovery experiences, emotion regulation, and affective well-being at bedtime were assessed in the diary, whereas control variables were assessed in the general questionnaire. We instructed participants to refer to their studies when asked for work-related experiences.

Emotional Stress

Analogous to the procedure used by Gable, Reis, Impett, and Asher (2004), we asked participants to recapture their most significant study-related event of the respective day and to briefly describe it. To assess emotional stress during this event, the questionnaire then provided nine items from a translated and adapted version of Fisher’s (2000) job emotion scale (Cole, Bruch, & Vogel, 2006). The participants had to rate their experience of emotions such as “frustrated,” “disappointed,” and “worried” in relation to the study-related event on a 5-point Likert scale ranging from $1 = “not at all”
to 5 = “very much.” Because this rating reflects a specific and situation based evaluation of the perceived emotions during the study-related event in question, the emotional stress values reflect how stressful the event was perceived. Cronbach’s alpha indicated a reliability of $\alpha = .89$.

**Recovery Experiences**

We assessed two specific recovery experiences in the evening, psychological detachment and relaxation, with items from Sonnentag and colleagues (2008) recovery experience questionnaire in its German version. In total, six items asked to what extent the participants detached from their studies and relaxed. Example items are, “Tonight, I was able to forget about university work” (psychological detachment from work) and, “Tonight, I was doing things during which I was able to relax” (relaxation). Participants could rate the items on a scale ranging from 1 = “not at all” to 5 = “very much.” To examine the factor structure prior to aggregating the items of this scale, we conducted an exploratory factor analysis. Without rotation, all items converged on one factor with an eigenvalue greater than one. This factor accounted for 72.8% of the variance; all item loadings exceeded .82. Cronbach’s alpha for the composite scale was $\alpha = .93$.

**Emotion Regulation**

For the assessment of the participants’ emotion regulation, we adapted four reappraisal and two expressive suppression items from the German version (Abler & Kessler, 2009) of Gross and John’s (2003) emotion regulation questionnaire to situational emotion regulation. This tool measures cognitive reappraisal and expressive suppression as two uncorrelated styles of intrapersonal emotion regulation and demonstrates adequate psychometric properties in terms of validity and reliability (Gross & John, 2003). We asked the participants to indicate to what extent they reappraised the situation (e.g., “I controlled my emotions by changing the way I think about the situation I was in”) and suppressed the expression of their feelings (e.g., “I kept my emotions to myself”) during the study-related event they had described beforehand. Participants answered via a 7-point Likert scale ranging from 1 = “not at all” to 7 = “very much.” To assure that reappraisal and expressive suppression formed two separate factors, we submitted all emotion regulation items to a principal components analysis with oblique rotation. Corroborating the measures’ discriminant validity, two factors emerged with eigenvalues greater than 1, accounting for 78.0% of the variance. The
items’ primary loadings on their appropriate factors were greater than .82; cross-loadings were lower than .26. The internal consistency was $\alpha = .89$ for reappraisal (Cronbach’s Alpha) and $r = .80$ for expressive suppression (Spearman’s correlation coefficient).

**Affective Well-Being**

We assessed affective well-being at bedtime with six items of the well-being scale by Warr, Butcher, and Robertson (2004) that we translated into German using the back-translation procedure (Brislin, 1970). Participants rated their general nonevent related well-being with these items (e.g., “At the moment, I feel happy”) on a 5-point Likert scale ranging from 1 = “not at all” to 5 = “very much.” Because of the employed diary design this measure reflects a situational evaluation of the affective well-being. Cronbach’s alpha for this scale was $\alpha = .83$.

**Controls**

To ensure that day-level affective well-being could actually be explained by the day-level predictors, we controlled for the sociodemographic data age and gender (assessed with one item each), as well as for dispositional affectivity. Positive and negative affectivity significantly influence a person’s recovery, affective well-being, and performance (Connolly & Viswesvaran, 2000; Lyubomirsky, King, & Diener, 2005; Marco & Suls, 1993; Watson & Clark, 1984). We measured dispositional affectivity using Krohne, Egloff, Kohlmann, and Tausch’s (1996) validated German version of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). Participants rated the extent to which they generally experience 10 positive feelings (e.g., “I generally feel proud”) and 10 negative feelings (e.g., “I generally feel upset”) on a 5-point Likert scale ranging from 1 = “not at all” to 5 = “very much.” Cronbach’s alpha was $\alpha = .83$ for positive affectivity and $\alpha = .89$ for negative affectivity.

**Data Analyses**

With the diary design of this study, we collected repeated measurement data. The two-level study consisted of day-level data (Level 1) and person-level data (Level 2), with days being nested in persons. For this kind of study, it is necessary to use the multilevel random coefficient modeling method
(MRCM; also called hierarchical linear modeling, HLM) to accurately fit the hierarchical data structure (e.g., Netzlek, Schröder-Abé, & Schütz, 2006; Raudenbush & Bryk, 2002). This method offers the advantage of working with different levels of analysis simultaneously, such that interrelations on different levels are statistically independent of each other (Netzlek et al., 2006). In the analyses, each data level is treated as a formally independent submodel. Use of the MRCM for analyzing multilevel data are important for several reasons: First, the MRCM offers the advantage that any bias in standard errors and statistical tests because of the interdependence of the data are adjusted for (Krull & MacKinnon, 2001; Snijders & Bosker, 1993). Second, MRCM takes the hierarchical data structure into account and thus avoids aggregation of the day-level variables which would result in a loss of power of the statistical tests because of the reduced number of higher level units. Thus, if the variability in the data was neglected, misinterpretation of the results would likely occur (Hox, 2010).

We used HLM 6.0 (Raudenbush, Bryk, Cheong, Congdon, & Du Toit, 2004) for our analyses. We centered the person-level control variables positive and negative affectivity at the grand mean and all day-level predictors at the respective person mean.

RESULTS

Descriptive Results

Participants reported 726 study-related events altogether ($M = 11.5$; $SD = 2.3$). Table 1 depicts the means, $SD$s, and correlations of all study variables. The correlation of $r = .43$ between reappraisal and expressive suppression on the day-level indicates that these two strategies were often applied in conjunction.

Hypotheses Testing

To test our hypotheses, we first calculated null models (Model 0) that included the intercept as the only predictor. For data evaluation this step is necessary, as it verifies whether sufficient variance exists in the criterion variables on the day-level as well as on the person-level to be explained by the respective predictors. For each hypothesis, we then added the relevant control variables in a second model (Model 1) and afterward conducted analyses with the predictors (Models 2 and 3). The models integrate every participant by a regression line including an intercept and a slope. For each
Table 1. Means, SDs, and Intercorrelations Between Study Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Emotional stress</td>
<td>1.96</td>
<td>0.96</td>
<td></td>
<td>-.25**</td>
<td>-.40**</td>
<td>.54**</td>
<td>.40**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Recovery experiences</td>
<td>2.78</td>
<td>0.82</td>
<td>-.14</td>
<td></td>
<td>.53**</td>
<td>-.10**</td>
<td>-.13**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Affective well-being</td>
<td>3.32</td>
<td>0.78</td>
<td>-.51**</td>
<td>.60**</td>
<td></td>
<td>-.16**</td>
<td>-.15**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Reappraisal</td>
<td>2.37</td>
<td>1.52</td>
<td>.29**</td>
<td>.14</td>
<td></td>
<td>.06</td>
<td></td>
<td>.43**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Expressive suppression</td>
<td>2.70</td>
<td>1.76</td>
<td>.38**</td>
<td>.04</td>
<td>-.09</td>
<td>.50**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Gender</td>
<td>—</td>
<td>—</td>
<td></td>
<td>.05</td>
<td>.14</td>
<td>.16</td>
<td>.06</td>
<td>.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Age</td>
<td>21.24</td>
<td>2.91</td>
<td>-.01</td>
<td>.08</td>
<td>.05</td>
<td>.29*</td>
<td>.18</td>
<td>.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Positive affectivity</td>
<td>3.57</td>
<td>0.49</td>
<td>-.34**</td>
<td>.35**</td>
<td>.47**</td>
<td>.12</td>
<td>-.12</td>
<td>-.02</td>
<td>-.13</td>
<td></td>
</tr>
<tr>
<td>10. Negative affectivity</td>
<td>2.96</td>
<td>0.66</td>
<td>.36**</td>
<td>-.47**</td>
<td>-.49**</td>
<td>.03</td>
<td>.18</td>
<td>-.07</td>
<td>.18</td>
<td>-.59**</td>
</tr>
</tbody>
</table>

Note. Below diagonal: person-level data (N = 63), above diagonal: day-level data (N = 726).

*a 1 = female, 2 = male.

* p < .05. ** p < .01.
multilevel model, model fit indices (deviances) indicate the model fit for the data. Differences of the deviances of two subsequent models follow a chi-square distribution and indicate if the additional predictors explain a significant additional amount of variance.

As Model 0 in Table 2 shows, the variance on both levels was indeed sufficient for both recovery experiences and affective well-being. Furthermore, both reappraisal and expressive suppression showed high levels of intrapersonal variance, indicating that it made sense to study their effects on a daily basis.

Next, we entered the control variables gender, age, and negative as well as positive affectivity (Level 2) as predictors in Model 1. In Model 2, we additionally entered emotional stress (Level 1). Finally, in Model 3, we included recovery experiences (Level 1). We tested each model for improved fit over the previous model by calculating differences in the deviances (∆−2 log likelihood) and submitting them to a chi-square test. Table 3 depicts the results.

The analysis showed that Model 1 improved significantly over Model 0 (∆−2 log likelihood = 25.16, df = 7, p < .001). The control variables positive and negative affectivity were significant predictors in this model. As proposed in Hypothesis 1, the intensity of emotional stress during a significant study-related event negatively affects affective well-being in the late evening. To test this hypothesis, we compared the model fit of Model 1 to the one of Model 2 in which the variable emotional stress was entered. As Model 2 showed an improved model fit (∆−2 log likelihood = 137.35, df = 8, p < .001), emotional stress contributed significantly to the prediction of affective well-being, and did so beyond the effects of negative and positive affectivity. Thus, data supported Hypothesis 1. The intensity of emotional stress during a significant study-related event had a negative impact on affective well-being at bedtime.

In Hypothesis 2, we postulated that recovery experiences mediate the negative relationship between emotional stress and affective well-being. Comparing the model fit between Model 2 and Model 3, the difference

<table>
<thead>
<tr>
<th>Table 2. Hierarchical Linear Modeling Estimates of Null Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable</td>
</tr>
<tr>
<td>Affective well-being</td>
</tr>
<tr>
<td>Recovery experiences</td>
</tr>
<tr>
<td>Reappraisal</td>
</tr>
<tr>
<td>Expressive suppression</td>
</tr>
</tbody>
</table>

Note. N = 726 occasions, N = 63 participants. γ_{00} = pooled intercept; σ² = within-person variance; τ_{00} = between-person variance. % of total variance that is within-person was computed with the formula σ²/(σ² + τ_{00}).

*** p < .001.
<table>
<thead>
<tr>
<th></th>
<th>Model 0</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>SE</td>
<td>t</td>
<td>Estimate</td>
</tr>
<tr>
<td>Intercept</td>
<td>3.32</td>
<td>0.05</td>
<td>62.65***</td>
<td>3.32</td>
</tr>
<tr>
<td>Gender</td>
<td>0.15</td>
<td>0.11</td>
<td>1.36</td>
<td>0.15</td>
</tr>
<tr>
<td>Age</td>
<td>0.02</td>
<td>0.01</td>
<td>1.52</td>
<td>0.02</td>
</tr>
<tr>
<td>Positive affectivity</td>
<td>-0.21</td>
<td>0.07</td>
<td>-2.86**</td>
<td>-0.20</td>
</tr>
<tr>
<td>Negative affectivity</td>
<td>0.26</td>
<td>0.07</td>
<td>2.87***</td>
<td>0.27</td>
</tr>
<tr>
<td>Emotional stress</td>
<td>0.28</td>
<td>0.03</td>
<td>8.52***</td>
<td>0.19</td>
</tr>
<tr>
<td>Recovery experiences</td>
<td>0.39</td>
<td>0.04</td>
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<tr>
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**Table 3.** Multilevel Estimates for Models Predicting Affective Well-Being: Recovery Experiences as Mediator

**Note.** N = 726 occasions, N = 63 participants. Unstandardized regression coefficients are reported.

* p < .05.  ** p < .01.  *** p < .001.
between the deviances was again significant ($\Delta -2 \text{ log likelihood} = 176.03$, $df = 9$, $p < .001$). This indicates that recovery experiences contributed significantly to the prediction of affective well-being beyond the previous variables.

According to Baron and Kenny (1986), we tested the data for a mediation effect in a stepwise procedure (results can be found in Table 3 and 4): First, the analyses showed that a significant relationship between the independent variable, emotional stress, and the mediator, recovery experiences existed ($\beta = -0.22$, $p < .001$). Second, we tested whether the relationship between the mediator, recovery experiences, and the dependent variable, affective well-being at bedtime, was significant. The analyses revealed a significant relationship between recovery experiences and affective well-being ($\beta = 0.39$, $p < .001$). Third, we tested the relationship between the independent variable, emotional stress, and the dependent variable, affective well-being, which proved to be significant ($\beta = -0.28$, $p < .001$). The effect of emotional stress on affective well-being decreased (from $\beta = -0.28$ to $\beta = -0.19$, $p < .001$) but remained significant after the mediator was included in the analyses. Because this speaks against full mediation, we tested for a partial mediation effect conducting the Sobel Test (Sobel, 1982) in its adjusted form for multilevel data (Krull & MacKinnon, 2001). In support of Hypothesis 2, the test revealed that the mediating effect for recovery experiences was significant ($z = -0.57$, $p < .001$). Thus, recovery experiences partially mediated the negative relationship between emotional stress and affective well-being.

Hypotheses 3 and 4 postulated different moderating effects of reappraisal and expressive suppression on the negative impact of emotional stress on recovery experiences. We supposed reappraisal to be buffering (Hypothesis 3) and expressive suppression to be enhancing (Hypothesis 4) the negative impact of emotional stress on recovery experiences. Again, we computed models of multilevel estimates in order to test the prediction of recovery experiences. Table 4 depicts the results. As before, Model 1 contained the control variables gender, age, and negative as well as positive affectivity (Level 2) as predictors. The difference of the likelihood ratio between Model 0 and Model 1 was significant ($\Delta -2 \text{ log likelihood} = 25.16$, $df = 7$, $p < .001$). In a next step, we entered emotional stress, reappraisal and expressive suppression as predictors in Model 2, which was then compared with Model 1. Model 2 showed a significantly improved model fit ($\Delta -2 \text{ log likelihood} = 146.91$, $df = 10$, $p < .01$). While emotional stress was negatively related to recovery experiences ($\beta = -0.22$, $p < .01$), reappraisal and expressive suppression did not prove to be significant predictors of recovery experiences. To test the moderation hypotheses (Hypotheses 3 and 4), we include the interactions between emotional stress and reappraisal and expressive suppression, respectively, in Model 3. Compared with Model 2, Model 3
Table 4. Multilevel Estimates for Models Predicting Recovery Experiences: Reappraisal and Expressive Suppression as Moderators

<table>
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<tr>
<th></th>
<th>Model 0</th>
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Note. N = 726 occasions, N = 63 participants. Unstandardized regression coefficients are reported. * p < .05. ** p < .01. *** p < .001.
showed a significantly smaller likelihood ratio (Δ = −2 log likelihood = 9.12, df = 12, p < .01). The interactions of emotional stress during a study-related event with reappraisal (β = 0.05, p < .01) and expressive suppression (β = 0.04, p < .05) showed significant influences on recovery experiences in the evening. Figure 2 displays these interaction effects.

An inspection of the simple slopes revealed that as expected in Hypothesis 3, reappraisal buffered the negative impact of emotional stress on recovery experiences. However, in contrast to Hypothesis 4, expressive suppression did not enhance the negative impact of emotional stress on recovery experiences, but had a buffering impact as well. We tested the simple slopes of both interaction effects using an online HLM calculator (Preacher, Curran, & Bauer, 2006). We selected 1 SD above the mean (high reappraisal and expressive suppression, respectively) and 1 SD below the mean (low reappraisal and expressive suppression, respectively) as conditional values of the emotion regulation strategies. For low reappraisal and expressive suppression, the negative simple slopes relating emotional stress to recovery experiences were significant (z = −1.98 for reappraisal and z = −1.96 for expressive suppression, p < .05). For high reappraisal and expressive suppression, the simple slopes were also negative, but nonsignificant (z = −1.83, p = .078 for reappraisal and z = −1.85, p = .066 for expressive suppression). Thus, only on days when reappraisal and/or expressive suppression were low, emotional stress was significantly, negatively related to recovery experiences.

Taken together, the data supported Hypotheses 1–3. Emotional stress had a negative relationship with affective well-being and recovery experiences partially mediated this relationship. That is, the negative impact of emotional stress on recovery experiences was weaker when the person reappraised the situation. In contrast to our expectations in Hypothesis 4, expressive sup-

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**Figure 2.** The moderating effects of reappraisal and expressive suppression on the relationship between emotional stress and recovery experiences.
pression had the same effect as reappraisal; it also buffered the negative impact of emotional stress on recovery experiences.

**DISCUSSION**

The present study integrates different lines of research from work stress, emotion regulation, and recovery, which to our knowledge have not been considered in combination before. The study shows how the situational application of emotion regulation can improve recovery experiences and subsequent affective well-being after stressful study-related events. It further extends the literature by taking an intrapersonal approach on these topics, leading to results that complement the conclusions drawn from individual differences research.

The aim of the present study was threefold: Our first goal was to examine the role of recovery experiences in the relationship between emotional stress and affective well-being. Analyses showed a negative impact of emotional stress during a significant study-related event on affective well-being at bedtime. Recovery experiences partially mediated this negative relationship. Our second goal was to test whether the application of emotion regulation strategies as a response to emotional stress impacts recovery experiences after stressful events at university or concerning the studies. The use of reappraisal to regulate one's emotions buffered the negative impact of emotional stress on recovery experiences, as did the use of expressive suppression. Both the mediation and moderation results even hold when controlling for trait positive and negative affectivity, strengthening the validity and significance of this study. Our third goal was to shed light on the effects of situational (instead of habitual) emotion regulation by implementing a diary design.

In summary, the study extends previous research in the stress domain in several ways. With regard to existing research on recovery experiences, our results improve the understanding of the link between job/study demands and health outcomes. Mediating effects of recovery experiences have recently been supported in a longitudinal study (Kinnunen, Feldt, Siltaloppi, & Sonnentag, 2011); however, our study is among the first to support these results on the day-level. Because there is only little research concerning predictors of recovery experiences, our findings further expand current knowledge by revealing emotional stress to be an inhibitor of recovery experiences (e.g., Cropley & Purvis, 2003; Sonnentag & Bayer, 2005). Furthermore, with its focus on situational emotion regulation, our study extends recovery research by pointing out a determinant that has similar beneficial effects as for example job control (cf. Cropley et al., 2006); both
reappraisal and expressive suppression apparently help in detaching and relaxing from emotional stress.

These results complement research on individual differences in emotion regulation and on experientially manipulated emotion regulation, which highlight reappraisal as a healthy form of emotion regulation (e.g., John & Gross, 2004; Mauss, Cook, Cheng, & Gross, 2007). They imply that, in the notion of the Job Demands-Resources Model (Demerouti et al., 2001), emotion regulation strategies can be considered a personal resource that moderates the consequences of emotional job demands. In accordance to the theoretical assumption that reappraisal prevents the experience of emotional stress to grow bigger by reframing the situation (Gross & John, 2003), our results show that reappraisal apparently makes further self-control after the emotionally stressful event less necessary, so that resources are freed for promoting recovery experiences. Unexpectedly, we found that expressive suppression, which is considered a rather unhealthy way of emotion regulation when applied habitually (John & Gross, 2004; Srivastava et al., 2009), also buffered negative effects of emotional stress. Although we argued for a resource-consuming negative effect of expressive suppression, this contradictory finding is in line with results of some other studies, giving rise to the question of whether expressive suppression should generally be considered a detrimental strategy (e.g., Befahr & Cronin, 2010; Cole, Walter, & Bruch, 2008; Schraub et al., 2011). In the present study, the definition and measurement of expressive suppression as situational emotion regulation may explain the unexpected positive effect of expressive suppression. This means that we accounted for inter- and intrapersonal variation and focused on emotion regulation in a specific situation rather than a habitual regulation strategy. Suppressing one’s emotional expression during the experience of increased emotional stress, in this case, turned out to be a useful mechanism to cope with the stress. We concur with Befahr and Cronin (2010) in assuming that interpersonal effects might play a significant role in explaining beneficial effects of expressive suppression. In the present study, the situational suppression of expressions of emotional stress may have evoked more positive responses from interaction partners. These positive responses may have, in turn, distracted from the negative experience. This would be in line with Sonnentag and Fritz’ (2007) argumentation that the expression of negative emotions can undermine recovery experiences by inducing continuing cognitive and emotional engagement with the adverse experience.

Our study results underline the importance of considering intrapersonal variation in emotion regulation; more than 80% of the variance in emotion regulation was attributable to intrapersonal variance. Thus, contextual or state antecedents seem to be stronger predictors of momentary emotion regulation than individual differences are. As discussed earlier, such a state focus may
lead to different outcomes than a habitual focus, and it may only be the chronic use of expressive suppression that has detrimental effects.

We consider the diary design of the present study to be its particular strength. Reducing probability for retrospective biases (Alliger & Williams, 1993), the diary method more adequately captures emotional experiences and well-being than do assessments at only one or two points of time, because emotions and well-being change in short intervals. Furthermore, effects of intrapersonal variance in emotion regulation can only be detected by repeated time- or event-contingent measurement, as used in this study. Indeed, the diary design and the respective adaptation of Gross and John’s (2003) emotion regulation questionnaire made it possible to reveal short-term effects of expressive suppression that diverge from those typically found in cross-sectional studies, or in longitudinal studies merely using individual difference measures. In addition, the high intrapersonal variance in affective well-being (about 75%) implies that by analyzing day-level antecedents of affective well-being, we gained information that gets lost in studies that conceptualize affective states as between-subjects variables (Netzlek et al., 2006).

**Limitations and Implications for Future Research**

Clearly, the sample of this study limits the generalizability of its results. Findings from examining undergraduate students who reported 4.8 work hours per day on average cannot be directly applied to employees in a work setting; demographic characteristics like age, family responsibilities and education might be important moderators of the consequences of significant emotional events on well-being. However, Chang and colleagues (2007), who compared employee and student samples with regard to the relationship between the experience of emotional stress and organizational citizenship behaviors in a meta-analysis, found a stronger effect for the employee sample. Taking these authors’ finding into account, our findings could be even more pronounced in an employee sample. Although we consider our results relevant for the current generation of university students, we recommend their replication in another context and with a demographically more diverse sample.

A methodological issue that may be improved in future research is data collection. A time-contingent assessment with higher frequency (e.g., three times per day) or an event-contingent assessment would allow the capture of events, emotions and behavior even closer to their occurrence and with higher internal validity. However, our repeated-measurement design allowed for control of between-person differences in the focus study variables and thus represents a more adequate assessment for the dynamic constructs we focused on than a cross-sectional assessment would have been.
For a possible explanation of the moderation effects, especially for the unexpected effect of expressive suppression in the present study, we draw on interactional theories of emotion regulation (Côté, 2005). These suggest that interaction partners’ reactions determine one’s well-being, meaning that (a) one’s (positive) emotional expression is mirrored in (b) (positive) reactions by the interaction partner, which again (c) influences (enhances) one’s well-being. Research showing that the suppression of verbal and nonverbal expressions of emotional stress at the workplace buffers negative effects on recovery and performance (Brown, Westbrook, & Challagalla, 2005; Cole et al., 2008; Sanz-Vergel, Demerouti, Moreno-Jiménez, & Mayo, 2010) supports this line of reasoning. It may well be that expressive suppression has positive effects in high-power-distance situations (e.g., between student and professor), but that it has negative effects in equal-power relationships (e.g., between student and significant other). Because we did not assess reactions by interaction partners in this study, we recommend follow-up research to shed light on this possible explanation of beneficial short-term effects of expressive suppression.

A related variable that determines the effects of expressive suppression are cultural values. In experimental settings, Butler, Lee, and Gross (2007, 2009) demonstrated that cultural context moderated the consequences of expressive suppression on both social and physiological measures during face-to-face interactions between American university students. Matsumoto, Yoo, and Nakagawa (2008) further showed that cultural values determine the use and the consequences of certain emotion regulation strategies. We can thus hypothesize that cultural orientations in Germany or, more specifically, in the academic setting, may have influenced our findings. As Schwartz (1999) demonstrated, Germans value intellectual autonomy higher than affective autonomy, which means that the pursuit of one’s own intellectual ideas is more important than the pursuit of affectively positive experiences. Hofstede (2001) found that Germans (compared with other cultures) have a medium level of uncertainty avoidance, which means they don’t feel very comfortable with ambiguity, thus taking measures to reduce it and to control the future. A hypothesis drawn from this could be that the combination of rather low Affective Autonomy and rather high uncertainty avoidance might make emotion regulation via expressive suppression more probable and accepted. The assessment of cultural context ranging from participants’ values on the individual level to organizational and societal culture (cf. Chao, 2000) would help to clarify this issue and extend the study’s external validity.

An additional variable that also relates to cultural values and that should be addressed in further studies is work significance. If work is highly significant for a person’s self-concept, negative work-related emotional experiences might provide more threat to this person’s self and, consequently, have stronger negative effects.
As shown in this and quite some other studies, recovery experiences are an important resource for affective well-being. Guided by Conservation of Resources theory (Hobfoll, 1989), a next step of research could be to investigate what factors help people not only to engage in recovery experiences, but to preserve their positive effects.

**Practical Implications**

The importance of emotion regulation and of daily recovery experiences in maintaining people’s well-being has been supported in this study. Because high levels of psychological stress and strain have been reported for the current student generation (Obergfell & Schmidt, 2010), we encourage universities to expand training and coaching programs, for example by integrating a preventive module on healthy studying techniques in introductory courses. In such stress management trainings (for examples, see Roger & Hudson, 1995; Walach et al., 2007), the topics of emotion regulation and recovery experiences should be addressed (cf. Hahn et al., 2011). According to our findings, participants should be informed about the potential harm of emotional stress for their well-being, learn how to regulate negative emotional experiences, as well as become aware of the importance of actively seeking recovery experiences. Altogether, students would thereby learn to reflect on their work-life-balance. Doing so in an early stage might not only prevent cases of psychologically exhausted students, but might also exert beneficial effects on people’s stress management in their later careers.

**CONCLUSION**

As this study demonstrates, recovery experiences depend on the way people deal with experiences of emotional stress. On days on which participants either reappraised the situation or suppressed their emotional expressions more than usual, they reported greater recovery experiences. In line with previous research, we conclude that reappraisal can be recommended as a healthy strategy to regulate one’s emotions. In addition, the suppression of emotional expressions may, applied in the situation evoking emotional stress, be helpful in overcoming experiences of emotional stress. We conclude that by learning how to use emotion regulation during emotionally stressful work situations, people can foster subsequent recovery experiences that restore their resources and consequently improve their affective well-being at bedtime.
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