Emotion


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# The Regulation of Negative and Positive Affect in Daily Life

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Emotion regulation has primarily been studied either experimentally or by using retrospective trait questionnaires. Very few studies have investigated emotion regulation in the context in which it is usually deployed, namely, the complexity of everyday life. We address this in the current paper by reporting findings of two experience-sampling studies (*N*s = 46 and 95) investigating the use of six emotion-regulation strategies (reflection, reappraisal, rumination, distraction, expressive suppression, and social sharing) and their associations with changes in positive affect (PA) and negative affect (NA) in daily life. Regarding the relative use of emotion-regulation strategies, a highly similar ordering was found across both studies with distraction being used more than sharing and reappraisal. While the use of all six strategies was positively correlated both within- and between-persons, different strategies were associated with distinct affective consequences: Suppression and rumination were associated with increases in NA and decreases in PA, whereas reflection was associated with increases in PA across both studies. Additionally, reappraisal, distraction, and social sharing were related to increases in PA in Study 2. Discussion focuses on how the current findings fit with theoretical models of emotion regulation and with previous evidence from experimental and retrospective studies.

*Keywords:* positive and negative affect, deliberate emotion regulation, experience sampling



The capacity to regulate emotions is central to psychosocial functioning (Gross & Thompson, 2007; Nyklíček, Vingerhoets, & Zeelenberg, 2011) and impacts various important outcomes, such as mental and physical health (Gross & Muñoz, 1995; Sapolsky, 2007), social functioning (Eisenberg, Farbes, Guthrie, & Reiser, 2000), relationships (Murray, 2005), and work performance (Diefendorff, Hall, Lord, & Strean, 2000). Despite the fact that research on emotion regulation has flourished over the past decades (Gross, Sheppes, & Urry, 2011), relatively little is known about how emotions are regulated in the context in which they are experienced, the complexity of everyday life.

Current knowledge about emotion regulation is primarily based on experimental studies (Gross & Thompson, 2007; Butler et al., 2003; Webb, Miles, & Sheeran, 2012) or studies relying on trait questionnaires (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Quoidbach, Berry, Hansenne, & Mickolacjzak, 2010). These studies provide important insights into emotion regulation; nevertheless, they lack the immediacy and ecological validity that can be achieved by investigating emotion regulation in daily life. Indeed, as recently argued by Mitchell (2012), the ecological validity of experimental findings needs to be verified.

More important, due to the predominance of experimental and trait-questionnaire research, some basic knowledge about the use and affective consequences of emotion regulation in the context of everyday life is lacking. For one, it is unclear which regulation strategies are spontaneously employed more often than others. Moreover, little is known about how even some of the most widely studied emotion-regulation strategies (e.g., distraction, reflection) are associated with changes in negative affect (NA) and positive affect (PA) in daily life. The current research therefore aimed to investigate the use of a broad range of emotion-regulation strategies, and their impact on NA and PA, in daily life.

## Emotion-Regulation Strategies

Emotion regulation has been defined as the strategies that people use to decrease, maintain, or increase their emotions (Gross, 2007). It has become apparent that emotion regulation is not a unitary construct, but comes in many different forms. As a result, several classifications have been developed to provide structure to the multitude of regulatory methods (for an overview, see Koole, 2009). A widely used classification, proposed by Parkinson and Totterdell (1999), distinguishes between deliberate regulation

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strategies on two factors: an "engagement" factor, relating to whether the affective experience is approached or avoided (i.e., whether attention is directed toward or away from the affective experience), and a "modality" factor, concerning whether affect is regulated using behavioral or cognitive means. Combining these two factors results in four categories of emotion-regulation strategies.

To obtain a representative sample of strategies for the purpose of the present study, we selected at least one regulation strategy from each of the four categories of emotion regulation in Parkinson and Totterdell's (1999) framework. From the cognitive-engagement category we included rumination, which is defined as passively and repetitively focusing on one's symptoms of distress (Nolen-Hoeksema, McBride, & Larson, 1997). However, because a number of other widely studied strategies fit into this category, we also included reflection, defined as positive self-reflection driven by epistemic curiosity (Trapnell & Campbell, 1999), and reappraisal, defined as a strategy by which attention is directed to the emotion-eliciting situation to change its subjective interpretation (Gross, 2007). From the cognitive-disengagement category, we selected distraction, defined as diverting one's attention away from the emotion-eliciting event (Gross, 1998; Van Dillen & Koole, 2007). To represent the behavioral-engagement category, we examined social sharing, which involves openly talking with someone else about the circumstances and/or emotional reactions related to a particular emotion-eliciting event (Rimé, 2009). Finally, we examined expressive suppression as an exemplar of the behavioral-disengagement category. Suppression is defined as the conscious inhibition of expressive or behavioral components of an emotion (Butler et al., 2003; Gross & Thompson, 2007).

These six strategies can also be situated within Gross's process model of emotion regulation, which categorizes emotion-regulation strategies according to the temporal order in which they occur in the emotion-generation process (Gross & Thompson, 2007). The five families of regulation strategies that are distinguished in this model are situation selection (occurring before the emotion-eliciting situation is encountered), situation modification (involving the alteration of features of the emotion-eliciting situation), attentional deployment (allocating attention to certain features of the situation), cognitive change (modifying one's cognitive interpretation or appraisal of the situation), and response modulation (changing one or more components of an emotional response). In this model, rumination and distraction map onto attentional deployment strategies, reappraisal and reflection can be considered to be forms of cognitive change, and expressive suppression and social sharing forms of response modulation.

## Use of Emotion-Regulation Strategies in Daily Life

A limitation of experimental research is that participants are typically instructed to use a particular strategy, depending on the experimental condition to which they are assigned. However, this procedure reveals little about the spontaneous selection of regulation strategies.

Several theoretical predictions can be made regarding the relative use of different regulation strategies. Specifically, it has been suggested that emotion-regulation strategies may differ in their ease of use, leading some to be preferred over others. For one, the choice may be influenced by emotional intensity. Specifically, Sheppes, Scheibe, Suri, and Gross (2011) showed that in high-intensity negative situations people prefer distraction over reappraisal, whereas in low-intensity situations, the reverse pattern was found. Because intense negative emotions are experienced less frequently than less intense negative emotions in daily life (e.g., Scherer, Wranik, Sangsue, Tran, & Scherer, 2004), one may hypothesize reappraisal to be more commonly used than distraction. On the other hand, distraction may be relatively easy to employ in the context of daily life, where we are constantly faced with numerous distracting stimuli and activities. In contrast, reappraisal is more cognitively demanding, especially if initiated late in the emotion-generation process (Sheppes & Meiran, 2008). From this perspective, one might expect distraction to be used more often than reappraisal in daily life. The present studies allowed the examination of which of these competing hypotheses is supported. Another strategy that may be relatively difficult to employ in daily life is social sharing, which inherently requires the presence of an appropriate sharing partner. We therefore predicted social sharing to be used less than other strategies, which can be used even when alone (e.g., reflection, distraction).

Furthermore, investigating multiple regulation strategies simultaneously makes it possible to examine associations between the use of different emotion-regulation strategies. For example, how does the use of reappraisal relate to the use of reflection? This can be done on two levels: within persons (e.g., when a person ruminates, is this person also likely to share his or her emotions with others?), and between persons (e.g., do people who habitually suppress their emotions tend not to use reappraisal as a regulation strategy?).

Regarding within-person relations, one may wonder whether people, when regulating their feelings, use a single strategy or multiple strategies? Drawing on the process model of emotion regulation it has been suggested that people may, much of the time, employ multiple emotion-regulation strategies (Webb et al., 2012). More specifically, as there are several ways to regulate one's emotions, and emotional changes often need to be made quickly, it may be useful to try several things at once (Gross & Thompson, 2007). Consistent with this idea of "coactive" emotion regulation, it has been shown in coping research that people tend to use a wide range of coping strategies simultaneously when confronted with stressful events (Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000; Folkman & Lazarus, 1980; Skinner, Edge, Altman, & Sherwood, 2003). For example, Folkman and Lazarus (1980) asked participants to report on stressful encounters they had recently experienced and to indicate which coping strategies they had used in these encounters. It appeared that in almost all encounters, both emotion- and problem-focused strategies had been used. Thus, coping strategies that are conceptually and empirically distinct can co-occur (Folkman & Moskowitz, 2004). Based on the idea of coactive emotion regulation and previous results from coping research, we hypothesized that people would use multiple emotion-regulation strategies concurrently to alter their feelings. Accordingly, we expected to find moderate, positive within-person correlations between the use of the different emotion-regulation strategies across time.

Regarding between-person associations, previous research suggests that there are stable differences between people in the regulatory strategies they tend to use (Gross & John, 2003). However, research on individual differences in emotion regulation has relied

almost exclusively on retrospective self-reports, which may be inaccurate due to distortion by cognitive and memory biases (Schwarz, 2012). A solution to this problem is to repeatedly assess emotion-regulatory behavior in a variety of situations and then aggregate these responses across situations for each individual (Schwarz, 2012). We adopted the latter approach and formulated the following predictions regarding relations between the average use of different emotion-regulation strategies.

In line with Gross and John's (2003) studies, we predicted that the use of reappraisal and suppression would be independent between persons. Furthermore, previous research has shown that people differ in terms of their general motivation to approach emotions (Maio & Esses, 2001). This may also apply to how people regulate their emotions, implying that certain people may tend to use engagement strategies (i.e., reflection, reappraisal, rumination and social sharing) when regulating their emotions, whereas others may tend to use disengagement strategies (i.e., suppression and distraction). We explored this possibility by examining associations between the four engagement strategies and two disengagement strategies, which we tentatively predicted to be positively correlated among themselves, and negatively correlated with one another.

## Relations Between Emotion Regulation and Affect in Daily Life

A second major aim of the present research was to investigate how the use of the different emotion-regulation strategies is associated with changes in affect in daily life. A number of studies have already investigated this issue, but they were limited in one or more of the following respects.

First, several previous studies have retrospectively assessed emotion regulation in daily life using end-of-day diary reports (e.g., Nezlek & Kuppens, 2008; Verduyn, Van Mechelen, & Tuerlinckx, 2011). Although more ecologically valid than retrospective questionnaires, this methodology remains susceptible to memory biases. Such biases can be minimized by using signal-contingent experience-sampling methods (ESM; Bylsma & Rottenberg, 2011; Csikszentmihalyi & Larson, 1987). Moreover, end-of-day reports ask to what extent people used a certain strategy or felt a certain emotion over the course of an entire day. Such a coarse-grained approach does not make it possible to examine how the use of a certain emotion-regulation strategy is followed by a change in affect from one moment to the next.

Second, previous studies have typically focused on a single emotion-regulation strategy (e.g., Moberly & Watkins, 2008a; 2008b). Investigating emotion-regulation strategies in isolation may be problematic because people may often use a wide range of regulation strategies simultaneously when confronted with an emotional event (Connor-Smith et al., 2000; Folkman & Lazarus, 1980; Skinner et al., 2003). How a particular strategy influences affect may depend on which other strategies were used concurrently. Therefore, it is important to investigate various emotion-regulation strategies simultaneously, making it possible to control for the use of other strategies.

Third, whereas some strategies have already been investigated in the way they are related to change in affect in daily life, some others have not. For example, using experience sampling, Moberly and Watkins (2008a, 2008b) showed that rumination predicted subsequent increases in NA in daily life. In a similar way, a number of studies have investigated the emotional impact of deep (e.g., reappraisal) and surface (e.g., expressive suppression) acting in organizational contexts (Totterdell & Holman, 2003). However, for a number of other strategies such as distraction and reflection, it remains to be seen whether they are effective in changing positive and negative feelings in everyday life.

Fourth, although some research has examined the impact of emotion-regulation strategies on changes in NA (e.g., Silk, Steinberg, & Morris, 2003), much less is known about how they impact PA in daily life. Whereas the deployment of emotion-regulation strategies may often be motivated by a desire to decrease NA (Gross, Richards, & John, 2006), there may be circumstances in which down-regulating PA is also important (e.g., in preparation for a competitive task; Tamir, 2009).

We aimed to address these limitations in the current studies by investigating how the different emotional regulation strategies under study are associated with short-term changes in both NA and PA in daily life. We advance the following hypotheses in this respect: Regarding the cognitive strategies, rumination involves continually focusing on negative thoughts and/or feelings associated with the emotion (Moberly & Watkins, 2008a, 2008b). In contrast, reappraisal, reflection, and distraction involve replacing thoughts and feelings with more positive or neutral thoughts that are either related (reappraisal and reflection) or unrelated to the emotion-eliciting stimulus (distraction) (Gross, 1998; Trapnell & Campbell, 1999; Van Dillen & Koole, 2007). We therefore predicted that rumination would be associated with a decrease in PA and an increase in NA, and reflection, reappraisal, and distraction would be associated with an increase in PA and a decrease in NA.

For the behavioral strategies, it has been argued that social sharing can provide emotional relief, and in addition, may instigate a process of reappraisal (Rimé, 2009). Consequently, we hypothesized that social sharing would be associated with an increase in PA and a decrease in NA. Expressive suppression is usually thought to involve the selective inhibition of the expressive component of emotions, but to have no effect on the subjective emotional experience (Gross & Levenson, 1997). Accordingly, one would expect expressive suppression to have no effect on subjective feelings of NA and PA. However, a recent meta-analysis of experimental studies found experimentally induced expressive suppression to be effective in reducing negative feelings (Webb et al., 2012). In contrast, another recent meta-analysis focusing on retrospective trait measures found the habitual use of expressive suppression to be positively correlated with symptoms of psychopathology (Aldao et al., 2010), suggesting that suppression may actually increase NA. Given that this latter meta-analysis examined the use of suppression in daily life (measured using global retrospective self-reports), we relied on these findings to derive our hypothesis that expressive suppression would be associated with an increase in NA and a decrease in PA in daily life.

In addition to our main research question regarding how the use of various emotion-regulation strategies is associated with changes in PA and NA, we also investigated the reverse causal process. Specifically, we examined whether affect at the previous time point is associated with current use of emotion-regulation strategies. As people are especially motivated to regulate negative emotions (Gross et al., 2006; Sonnemans & Frijda, 1995), we hypothesized that negative affect would be associated with subse-

quent increases in the use of all regulation strategies. In contrast, positive emotions require less acute regulation in general, and consequently, we expected that PA is not a strong predictor of subsequent use of emotion-regulation strategies.

## The Present Studies

To recapitulate, the first major aim of the present studies was to investigate the use of six emotion-regulation strategies in daily life. To address this, we first compared the extent to which each emotion-regulation strategy was used, on average. Subsequently we examined both within-person (i.e., across time) and between-person associations between the use of emotion-regulation strategies. The second major aim of the present research was to investigate how the use of different emotion-regulation strategies is related to changes in momentary positive and negative feelings in daily life.

To address these questions, we conducted two studies using the ESM (Csikszentmihalyi & Larson, 1987). In each study, participants were prompted 10 times each day to report their current experiences of PA and NA, and their use of several emotion-regulation strategies since the previous sampling moment. The resulting data allowed us to examine the use and emotional impact of each emotion-regulation strategy in daily life.

## Study 1

### Method

**Participants.** Initially, 50 participants (26 women) were recruited through the Careers and Employment Service at the University of Melbourne. Four participants were excluded due to poor compliance (i.e., $>$ 50% missing data), leaving a final sample of 46 participants (25 women), ranging in age from 18 to 35 years ($M$ = 21.57; $SD$ = 3.88), who received AU$40 each for their participation.

### Materials and Procedure

**Initial lab session.** Participants attended an introduction session during which they received information about the study, gave their informed consent, and provided demographic information. Participants received a palmtop (Tungsten E2 PalmOne, Mankato, MN), a charger, and instructions for their use.

**ESM protocol.** The palmtop was programmed with the Experience-Sampling Program (Barrett, & Barrett, 2000) to "beep" 10 times daily for seven consecutive days during participants' normal waking hours. Beeps were scheduled semirandomly, such that each day was divided into 10 equal intervals and a beep was scheduled randomly within each interval. The mean time interval between beeps was 80.68 minutes ($SD$ = 37.39). Participants responded to 77.5% of the generated beeps ($SD$ = 12.5%, range = 55–99%), a response rate comparable with those obtained in similar studies (e.g., Stone & Broderick, 2009; Swendsen, 1997). At each beep, participants responded to the following items in random order.

**Momentary PA and NA.** At each beep, participants reported their current feelings using two positive adjectives (*happy*, *relaxed*) and four negative adjectives (*angry*, *stressed*, *anxious*, and *depressed*). Items were in the form of: "At the moment, I feel happy" and so forth. Each item was rated on a 6-point scale from 0 (*not at all*) to 5 (*very happy*, etc.). PA and NA scales were calculated by averaging the positive and negative items, respectively. Multilevel reliability analyses (following Nezlek, 2012) indicated that the NA scale had a beep-level reliability of .65 and a person-level reliability of .98, and the PA scale had a beep-level reliability of .58 and a person-level reliability of .97.

**Emotion-regulation strategies.** At each beep, participants reported on the extent to which they had engaged in each of six emotion-regulation strategies since the previous sampling moment. Each strategy was measured using a single item that began with "Since the previous beep . . ." and ended with "I have calmly reflected on my feelings" (reflection), "I have changed the way I think about what causes my feelings" (reappraisal), "I couldn't stop thinking about my feelings" (rumination), "I have talked about my feelings with others" (social sharing), "I have avoided expressing my emotions" (expressive suppression), and "I have engaged in activities to distract myself from my feelings" (distraction). Each item was rated on a 6-point scale from 0 (*not at all*) to 5 (*very much so*).

**Data analysis.** To account for the hierarchical structure of the collected data (i.e., beeps nested within persons), we conducted multilevel modeling analyses using HLM 7.0 (Raudenbush et al., 2011). Model equations and further details can be found in the appendix.

First, to examine differences in the relative use of the different emotion-regulation strategies, we constructed 3-level models (i.e., items nested within beeps, and beeps nested within persons), in which emotion-regulation scores at each beep were predicted by dummy variables representing five of the six regulation strategies, with the sixth strategy serving as a reference category. Thus, the Level-1 intercept in each model represented the mean score for the sixth emotion-regulation strategy that was not represented by any of the dummy predictors, and the five dummy variables represented differences between each regulation strategy and the reference category (see Model 1 in Appendix). To evaluate differences between strategies, the beta weights for each strategy (reflecting differences from the reference category) were tested for significance against zero (applying a Bonferroni correction for multiple comparisons).

Second, we examined how emotion-regulation strategies were associated within individuals across time by calculating within-person correlations obtained from multilevel models, as proposed by Nezlek (2012; see Model 2 in Appendix). Because the resulting correlations are not symmetrical, the reported coefficients represent the average of the correlations obtained when each variable was entered as the outcome and the predictor for each pairwise relationship.

Third, to investigate individual differences in the use of the different regulation strategies, we first aggregated the momentary reports for each person by calculating for each person-regulation strategy combination the average of the momentary reports across the entire study. By aggregating, one can reduce situational variance and measure traits (Schimmack, Oishi, Diener, & Suh, 2000). Using these mean emotion-regulation scores, we then calculated correlations between each pair of regulation strategies across participants.

Fourth, before turning to our principal analyses (that is, whether the use of the different emotion-regulation strategies predicted

change in affect), we investigated whether affect predicted changes in the use of the six emotion-regulation strategies. For this purpose, we made use of an auto-correlation/cross-correlation approach. The auto-correlation/cross-correlation approach provides the best approximation of causal relationships based on multivariate time-series data (Bakeman & Gottman, 1997; Granger, 1969). In particular, we conducted two-level models predicting the use of a particular regulation strategy at sampling moment *t* (e.g., rumination at *t*) by affect at *t*-1 (e.g., $NA_{t-1}$), controlling for the use of the emotion-regulation strategy at sampling moment *t*-1 (e.g., rumination at *t*-1). In these analyses, all Level-1 predictors were group-mean centered (i.e., around each participants' mean score) to control for between-person differences in affect and emotion regulation. This approach allowed us to infer how affect at *t*-1 relates to changes in the use of a particular regulation strategy from *t*-1 to *t*. Separate analyses were conducted for PA and NA (See Model 3 in Appendix).

Finally, to examine the impact of each emotion-regulation strategy on changes in PA and NA, we again made use of an auto-correlation/cross-correlation approach. Specifically, we conducted two-level models predicting affect at sampling moment *t* from the six emotion-regulation scores at *t* (reflecting their use since the previous sampling moment) and affect at the previous sampling moment, *t*-1. In these analyses, all Level-1 predictors were group-mean centered (i.e., around each participants' mean score). This approach allowed us to infer how the use of a particular regulation strategy between *t*-1 and *t* relates to changes in affect from *t*-1 to *t*, while controlling for the use of all other emotion-regulation strategies. Separate models were conducted for PA and NA (see Model 4 in Appendix).

## Results

### Use of emotion-regulation strategies in daily life.

***Relative use of emotion-regulation strategies.*** The means and standard deviations for the six emotion-regulation strategies are presented in Table 1. Mean scores for distraction and reflection were significantly higher than rumination, social sharing, and reappraisal. Moreover, suppression was also used significantly more than reappraisal.

One may note that the mean ratings of emotion-regulation strategies presented in Table 1 reflect a combination of how often (i.e., frequency) and how much (i.e., intensity) each regulation strategy was used on average. We therefore decomposed emotion regulation scores into separate frequency and intensity estimates (following Schimmack & Diener, 1997) and examined how often and how much each strategy was used relative to the others. The strategies in descending order of frequency were: reflection, distraction, rumination, suppression, reappraisal, and social sharing; and in descending order of intensity: distraction, social sharing, suppression, reflection, rumination, and reappraisal.

***Relations between emotion-regulation strategies.*** For each emotion-regulation strategy, we first calculated the intraclass correlation (ICC), representing the proportion of variance at the between-person level (see Table 2). ICCs ranged from .21 (for social sharing) to .50 (for distraction), with an average of .40, suggesting that both the situation and the person play a role in the use of emotion regulation. Within-person correlations between emotion regulation scores are presented in Table 2 (above the diagonal). In line with our hypothesis, all emotion-regulation strategies were significantly positively correlated with each other, with correlations ranging from .12 (social sharing with distraction) to .36 (rumination with reflection). Between-person correlations in the mean use of the emotion-regulation strategies are presented in Table 2 (below the diagonal). All correlations were also significantly positive, ranging from .40 (sharing with suppression) up to .80 (rumination with suppression).

***Impact of PA and NA on emotion-regulation strategies.*** When investigating whether affect predicted change in the use of emotion-regulation strategies, it appeared that, as hypothesized, NA predicted a significant increase in the use of rumination, distraction, reappraisal, and suppression ($ps < .05$), and a marginally significant increase in the use of reflection and sharing ($ps < .10$). Furthermore, in line with our hypothesis, PA did not predict change in the use of the emotion-regulation strategies (all $ps > .10$).

***Impact of emotion-regulation strategies on PA and NA in daily life.*** Results of the multilevel models examining associations between use of each emotion-regulation strategy and changes in PA and NA are presented in Table 3. In a first model examining

Table 1
*Descriptive Statistics in Study 1 and Study 2*

| | Study 1 | | | | | | Study 2 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *n* | | | *SD* | | | *n* | | | *SD* | | |
| Measure | Level 1 | Level 2 | *M* | Between persons | Within persons | % Zero responses | Level 1 | Level 2 | *M* | Between persons | Within persons | % Zero responses |
| NA | 2496 | 46 | 1.10 | 0.76 | 0.76 | 28.2 | 5725 | 95 | 15.65 | 10.66 | 10.99 | 9.3 |
| PA | 2496 | 46 | 3.07 | 0.62 | 0.97 | 3.2 | 5722 | 95 | 57.26 | 12.98 | 17.91 | 0.2 |
| Distraction | 2491 | 46 | $1.79_{a}$ | 1.16 | 1.17 | 38.1 | 5719 | 95 | $29.48_{a}$ | 16.31 | 20.91 | 12.6 |
| Reflection | 2490 | 46 | $1.63_{a}$ | 0.92 | 1.12 | 30.3 | 5719 | 95 | $23.18_{bc}$ | 11.96 | 18.65 | 14.8 |
| Suppression | 2490 | 46 | $1.47_{ac}$ | 0.97 | 1.17 | 39.7 | 5721 | 95 | $23.92_{bc}$ | 15.42 | 18.91 | 16.5 |
| Rumination | 2488 | 46 | $1.31_{bc}$ | 0.85 | 1.06 | 38.7 | 5719 | 95 | $27.29_{ac}$ | 16.77 | 20.10 | 13.8 |
| Sharing | 2493 | 46 | $1.16_{bc}$ | 0.68 | 1.31 | 51.2 | 5719 | 95 | $21.43_{bd}$ | 11.99 | 20.67 | 19.0 |
| Reappraisal | 2488 | 46 | $1.10_{b}$ | 0.87 | 0.93 | 45.7 | 5719 | 95 | $18.29_{e}$ | 11.51 | 15.28 | 18.0 |

*Note.* NA = negative affect; PA = positive affect; means and (within- and between-person) standard deviations are obtained from two-level models. To test significant differences between emotion-regulation strategies, a three-level model was used (see Model 1 in the Appendix). Within columns, means of emotion-regulation strategies that do not share a subscript differ significantly at $p < .05$ after Bonferroni correction for multiple comparisons.

change in PA as a function of the six regulation strategies, rumination and expressive suppression were associated with (marginally) significant decreases in PA, as predicted. Furthermore, as expected, reflection was associated with a significant increase in PA. Surprisingly, reappraisal, sharing and distraction were not related to changes in PA. In a second model examining change in NA, rumination and expressive suppression were related to significant increases in NA, supporting our hypotheses. In contrast, the remaining strategies were not associated with change in NA.

In addition, we investigated whether these findings were moderated by gender (see Model 5 in Appendix). When predicting PA, gender moderated the effect of reflection, $t(44) = 2.81$, $p = .007$, in that, only for women, reflection was associated with an increase in PA, but not for men. Further, when predicting NA, gender did not moderate any of the effects of the emotion-regulation strategies.

## Discussion

Regarding relative use, distraction and reflection were among the most frequently used regulation strategies, followed by expressive suppression and rumination, and finally social sharing and reappraisal. Given that the mean level of NA experienced was relatively low in this study, the present findings are not in line with the results from Sheppes et al. (2011), which showed that, in low intensity-negative situations, reappraisal is preferred over distraction. Rather, the observed order may reflect the ease with which the different strategies can be employed. It could be argued that in the ebb and flow of everyday life, people need to adapt quickly to constantly changing situational demands, and in these circumstances, distraction may be easier to use than reappraisal—a strategy which, if initiated late in the emotion regulation process, is cognitively demanding (Sheppes & Meiran, 2008) and perhaps, therefore, less preferred. In a similar way, distraction may be easier to apply than social sharing, which requires the availability and presence of a suitable sharing partner.

All six emotion-regulation strategies were positively correlated within persons, which suggests that people typically make use of several strategies at a time when regulating their feelings, rather than only a single strategy. These findings line up with the idea of coactive emotion regulation in the process model of emotion regulation and previous research on coping, which also suggests that multiple strategies at a time are used.

In terms of the average use of strategies across persons, it was surprising to learn that all correlations were again positive. These findings may suggest a global distinction between high and low regulators: Some individuals regulate their feelings a lot, using multiple strategies, whereas other individuals regulate their feelings less.

Regarding the relation between regulation and changes in PA and NA, we found that rumination and suppression were related to decreases in PA and increases in NA. Furthermore, reflection was associated with an increase in PA (but no change in NA). Contrary to our predictions, reappraisal, distraction, and sharing were not associated with significant changes in either PA or NA. These findings can be used to identify more or less adaptive emotion-regulation strategies, at least in terms of how they modally affect emotional experience across situations and people. In light of a recent experience-sampling study showing that people are mostly driven by prohedonic motivations when regulating their emotions in daily life (Riediger, Schmiedek, Wagner, & Lindenberger, 2009), our findings that rumination and expressive suppression are associated with increases in NA suggest that they are maladaptive strategies. In contrast, reflection may be a more adaptive strategy, as it was found to be associated with increases in PA.

Although this study provided a number of valuable insights, some of the results were not in line with our hypotheses. For example, the use of reappraisal was not associated with an increase in PA or a decrease in NA. Therefore, it seemed desirable to replicate our findings in a second study.

Table 2
*Within- and Between-Person Correlations Among Emotion-Regulation Strategies in Study 1*

| Measure | 1 | 2 | 3 | 4 | 5 | 6 | ICC |
|---|---|---|---|---|---|---|---|
| 1. Distraction | — | .26 | .35 | .30 | .12 | .23 | 0.50 |
| 2. Reflection | .68 | — | .30 | .36 | .30 | .34 | 0.40 |
| 3. Suppression | .79 | .54 | — | .34 | .19 | .31 | 0.41 |
| 4. Rumination | .78 | .74 | .80 | — | .22 | .34 | 0.39 |
| 5. Sharing | .45 | .72 | .40 | .57 | — | .27 | 0.21 |
| 6. Reappraisal | .66 | .66 | .74 | .79 | .63 | — | 0.47 |

*Note.* ICC = intraclass correlation, which represents the proportion of variance at the between-person level. Correlations above the diagonal are within-person correlations obtained from multilevel analyses (see Nezlek, 2012). Correlations below the diagonal are between-person correlations calculated using mean emotion-regulation scores. All correlations are significant at $p < .01$.

Table 3
*Weights of the Emotion Regulation Strategies When Predicting Change in Negative and Positive Affect in Study 1*

| | Fixed effects | | | |
|---|---|---|---|---|
| | Negative affect | | Positive affect | |
| Parameter | *B* (*SE*) | *p* | *B* (*SE*) | *p* |
| Intercept ($\gamma_{00}$) | 1.09 (0.11) | <.001 | 3.07 (0.09) | <.001 |
| Distraction ($\gamma_{10}$) | 0.01 (0.02) | .524 | 0.01 (0.03) | .796 |
| Reappraisal ($\gamma_{20}$) | 0.03 (0.03) | .309 | 0.03 (0.03) | .311 |
| Reflection ($\gamma_{30}$) | −0.00 (0.02) | .942 | 0.08 (0.03) | .005 |
| Rumination ($\gamma_{40}$) | 0.18 (0.03) | <.001 | −0.13 (0.04) | <.001 |
| Sharing ($\gamma_{50}$) | 0.02 (0.02) | .356 | 0.02 (0.02) | .462 |
| Suppression ($\gamma_{60}$) | 0.07 (0.02) | .002 | −0.05 (0.03) | .065 |
| $Affect_{t-1}$ ($\gamma_{70}$) | 0.24 (0.03) | <.001 | 0.23 (0.03) | <.001 |

*Note*. All random effects were significant ($ps < .05$), except for distraction ($p = .06$) and social sharing ($p = .11$) when predicting positive affect.

## Study 2

The goal of the present study was to provide an independent replication of the results observed in Study 1 in a different sample of participants in order to identify consistent patterns of emotion regulation in daily life. The data reported here were part of a larger study on emotional functioning and well-being. Among other measures, the study included an experience-sampling component assessing the use of the same six emotion-regulation strategies as in Study 1, as well as PA and NA. Consequently, these data were

ideally suited to verifying our findings from Study 1. Despite these similarities between the two studies, there were also some differences: First, Study 2 had a sample size twice that of Study 1, which has the advantage of increasing power. Second, Study 2 was conducted in Belgium whereas Study 1 was conducted in Australia. Although these countries are very distant geographically, they are comparable on cultural dimensions, such as individualism and masculinity (Hofstede, 2001). Third, participants were preselected on depressive symptoms in Study 2 (see below).

## Method

**Participants.** Participants were recruited from a pool of 439 undergraduates at the University of Leuven, who completed the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) approximately four months before our study began. For the purposes of the larger study, 100 participants were selected to maximize variation on the CES-D, with scores ranging from 0 to 50 ($M = 19.27$, $SD = 12.53$). From these 100 participants, one participant withdrew early from the study and another four participants were excluded from data analyses (due to equipment malfunction, $n = 3$; due to poor compliance, i.e., $> 40\%$ missing data, $n = 1$)[1], leaving a final sample of 95 participants (59 women), ranging in age from 18 to 24 years ($M = 19.06$, $SD = 1.28$). Participants received payment of €70 for their involvement in the larger study.

**Materials and procedure.**

***Introduction session.*** Similar to Study 1, on the first day of the study participants attended an introductory session during which they were informed about the study, provided informed consent, and received a palmtop (Palm Tungsten E2, Mankato, MN).

***ESM protocol.*** The protocol was the same as in Study 1, with the exception of some slight alterations to the wording of items (see below). The average time interval between beeps was 73.30 min ($SD = 29.33$). Compliance with the ESM protocol was high: The mean proportion of completed beeps was 91.5% ($SD = 6.2\%$; range = 67–100%).

***Momentary PA and NA.*** Participants rated their current feelings of NA (*angry*, *sad*, *anxious*, and *depressed*) and PA (*happy*, *relaxed*) on a slider scale from 0 (*not at all*) to 100 (*very much*). As in Study 1, PA and NA scales were calculated by averaging the positive and negative items, respectively. Multilevel reliability analyses revealed that the NA scale had beep-level reliability of .66 and person-level reliability of .98. For the PA scale, beep-level reliability was .65 and person-level reliability was .97.

***Emotion-regulation strategies.*** The same six emotion-regulation strategies as in Study 1 were measured, although the wording of some items differed slightly. Each item again began with "Since the last beep . . .", and ended with "did you ruminate about your feelings" (rumination), "did you calmly reflect on your feelings?" (reflection), "did you see the event that caused your feelings from a different perspective?" (reappraisal), "did you try to distract yourself from your feelings?" (distraction), " did you talk with others about your feelings?" (social sharing), and "did you suppress the expression of your feelings?" (expressive suppression). All six emotion regulation items were rated on a slider scale ranging from 0 (*not at all*) to 100 (*very much so*).

***Depressive symptoms.*** During the study, participants completed the CES-D again. The mean CES-D score was now 14.66 ($SD = 9.67$).[2]

***Data analysis.*** We used the same models as those described in Study 1 to analyze the data. See Appendix for multilevel model equations and further details.

## Results

**Use of emotion-regulation strategies in daily life.**

***Relative use of emotion-regulation strategies.*** The means and standard deviations for the six emotion-regulation strategies are presented in Table 1. Similar to Study 1, distraction had the highest mean score, followed by rumination, expressive suppression, and reflection, respectively. Similar to Study 1, the least used strategies were social sharing and reappraisal.

As in Study 1, we decomposed emotion-regulation scores into frequency and intensity variables to separately examine how often and how much each strategy was used. The strategies in descending order of frequency were: distraction, rumination, reflection, suppression, reappraisal, and sharing; and in descending order of intensity: distraction, rumination, suppression, reflection, sharing, and reappraisal.

***Relations between emotion-regulation strategies.*** As shown in Table 4, ICCs (proportion of variance at the between-person level) for the emotion-regulation strategies ranged from .25 (social sharing) to .41 (rumination). As in Study 1, all emotion-regulation strategies were moderately positively associated within persons (Table 4, above the diagonal), with correlations ranging from .17 (social sharing with expressive suppression and distraction) to .38 (rumination with reflection). Between-person correlations between the mean use of emotion-regulation strategies across persons (Table 4, below the diagonal) again showed positive associations across the board, ranging from .21 (sharing with suppression) to .78 (reappraisal with reflection).

***Impact of PA and NA on emotion regulation.*** As in Study 1, we investigated whether NA and PA predicted changes in the use of the emotion-regulation strategies under study. In a similar way to Study 1, NA predicted an increase in the use of all six emotion-regulation strategies (all $p$s $< .05$), whereas it appeared that PA predicted a decrease in rumination, reflection, reappraisal, and expressive suppression (all $p$s $< .05$). Like Study 1, PA did not predict changes in the use of social sharing ($p = .35$) and distraction ($p = .86$).

***Impact of emotion-regulation strategies on PA and NA in daily life.*** In a first model examining changes in PA, rumination and expressive suppression were related to significant decreases in PA, replicating the findings of Study 1 (see Table 5). Also consistent with Study 1, reflection was associated with a significant increase

[1] In Study 2, a stricter compliance cut-off was used ($> 40\%$) to be consistent with other reports based on these data (see e.g., Koval, Kuppens, Allen, & Sheeber, 2012). This also seemed fair given the higher average compliance in Study 2 compared with Study 1.

[2] For participants in Study 1, information on depression was available too. In Study 1, CES-D scores ranged from 1 to 43, with a mean of 15.37 ($SD = 9.72$). For both samples, scores are similar to recently reported normative scores for the CES-D in an Australian sample (Crawford, Cayley, Lovibond, Wilson, & Hartley, 2011): For people between the ages of 18 and 24 years, the mean CES-D score was 14.08 ($SD = 10.91$).

in PA. Further, in line with our original hypotheses, sharing, reappraisal and distraction were also associated with significant increases in PA. In a second model examining changes in NA, rumination and expressive suppression were related to significant increases in NA, replicating our findings from Study 1. Social sharing was also associated with an increase in NA. Consistent with Study 1, the other three strategies did not predict changes in NA.

Similar to Study 1, we investigated whether these effects were moderated by gender (see Model 5 in Appendix). It appeared that, when predicting PA, gender moderated the effects of rumination, $t(93) = -3.33$, $p = .001$ and reflection, $t(93) = 2.42$, $p = .018$. Further analyses showed that for rumination the decrease in PA was more pronounced for women than for men. For reflection, it appeared again that for women, reflection was associated with an increase in PA, but not for men. Further, when predicting NA, gender moderated the effect of rumination, $t(93) = 2.52$, $p = .014$, in that the increase in NA was more pronounced for women than for men.

In addition, as participants were prescreened on depressive symptoms, we investigated whether these findings were moderated by depression (see Model 5 in Appendix). For these analyses, the CES-D scores that were collected during the study were used. Analyses revealed that, when predicting PA, it was found that depression only moderated the effect of distraction, $t(93) = 2.56$, $p = .012$, in that for people high in depression, a larger increase in PA was predicted. Second, when predicting NA, it was found that depression moderated the effect of rumination, $t(93) = 2.83$, $p = .006$ and distraction, $t(93) = -2.61$, $p = .011$: Rumination was more strongly associated with an increase in NA, and distraction was more strongly associated with a decrease in NA for people scoring high on depression compared with people scoring low.[3]

## Discussion

The goal of this study was to replicate the findings from Study 1. Despite some differences between the studies, Study 2 replicated most of the main findings from Study 1. First, with regard to the relative incidence of the different emotion-regulation strategies, a highly similar ordering was found in both studies. Distraction appeared to be used significantly more than social sharing and reappraisal. Suppression was used at an intermediate level. The difference between the two studies was that reflection and rumination switched position.

Regarding within-person interrelations, all regulation strategies were again moderately positively correlated. Also regarding between-person relations, the findings again pointed to positive correlations between the mean use of the six emotion-regulation strategies.

Finally, the findings from analyses examining the impact of emotion regulation on changes in PA and NA replicated and extended our findings of Study 1. As in Study 1, rumination and expressive suppression were related to decreases in PA and increases in NA. Moreover, as in Study 1, reflection was associated with an increase in PA (but no change in NA). Furthermore, in line with our initial hypotheses, reappraisal and distraction were related to an increase in PA in the current study. We were somewhat surprised that social sharing was related to increases in both PA and NA in the current study. These paradoxical effects may be due to the fact that talking about negative feelings may involve reliving the event, which may stir up the negative feelings again. On the other hand, as we hypothesized, talking about feelings may also have a number of beneficial consequences: For example, people may feel supported by their sharing partner or may start to see the event from a more benign perspective.

We note that there were some minor differences between the two studies regarding associations between the different regulation strategies and changes in affect. One might argue that this divergence in findings between studies may be due to differences in sample characteristics (depression scores, location, and sample size). First, depression severity seems unlikely to account for the observed differences between studies, as both samples displayed highly comparable CES-D distributions, despite the preselection of

Table 4
*Within- and Between-Person Correlations Among Emotion-Regulation Strategies in Study 2*

| Measure | 1 | 2 | 3 | 4 | 5 | 6 | ICC |
|---|---|---|---|---|---|---|---|
| 1. Distraction | — | .26 | .29 | .23 | .17 | .21 | .38 |
| 2. Rumination | .41 | — | .34 | .38 | .22 | .21 | .41 |
| 3. Suppression | .63 | .60 | — | .22 | .17 | .19 | .40 |
| 4. Reflection | .42 | .45 | .35 | — | .33 | .34 | .29 |
| 5. Sharing | .30 | .37 | .21 | .65 | — | .30 | .25 |
| 6. Reappraisal | .51 | .35 | .43 | .78 | .67 | — | .36 |

*Note.* ICC = Intraclass correlation, which represents the proportion of variance at the between-person level. Correlations above the diagonal are within-person correlations obtained from multilevel analyses (see Nezlek, 2012). Correlations below the diagonal are between-person correlations calculated using mean emotion regulation scores. All correlations are significant at $p < .01$.

Table 5
*Weights of the Emotion-Regulation Strategies When Predicting Change in Negative and Positive Affect in Study 2*

| | Fixed effects | | | |
|---|---|---|---|---|
| | Negative affect | | Positive affect | |
| Parameter | β (*SE*) | *p* | β (*SE*) | *p* |
| Intercept ($\gamma_{00}$) | 15.57 (1.09) | <.001 | 57.34 (1.36) | <.001 |
| Distraction ($\gamma_{10}$) | −0.00 (0.01) | .781 | 0.05 (0.02) | .001 |
| Reappraisal ($\gamma_{20}$) | 0.01 (0.01) | .273 | 0.05 (0.02) | .004 |
| Reflection ($\gamma_{30}$) | 0.02 (0.01) | .138 | 0.05 (0.02) | .003 |
| Rumination ($\gamma_{40}$) | 0.18 (0.01) | <.001 | −0.25 (0.02) | <.001 |
| Sharing ($\gamma_{50}$) | 0.03 (0.01) | .002 | 0.05 (0.01) | <.001 |
| Suppression ($\gamma_{60}$) | 0.09 (0.01) | <.001 | −0.11 (0.02) | <.001 |
| $Affect_{t-1}$ ($\gamma_{70}$) | 0.20 (0.02) | <.001 | 0.27 (0.02) | <.001 |

*Note*. All random effects were significant ($ps < .05$), except for reappraisal when predicting NA ($p = .07$) and for reflection ($p = .11$) and reappraisal ($p = .48$) when predicting PA.

[3] Because information on the CES-D was also available in Study 1, we also checked in this study whether our findings were moderated by depression. In Study 1, when predicting PA, depression did not moderate the effect of any of the emotion-regulation strategies. When predicting NA, depression moderated the effect of suppression, $t(44) = -2.10$, $p = .041$, in that for people high in depression, suppression was associated with a smaller increase in NA.

participants on CES-D in Study 2. Second, similarly, it is improbable that location (Australia vs. Belgium) would explain the differences between studies, as it has been shown that these countries are comparable on a number of important cultural dimensions (Hofstede, 2001). Rather it seems most likely that the increased sample size in Study 2 (double that of Study 1), led to an increase in power, which allowed some of the marginal trends observed in Study 1 to become significant.

## General Discussion

The aim of the present studies was to complement experimental and trait-based research on emotion regulation by investigating the use and emotional consequences of a number of different emotion-regulation strategies in daily life. We attempted to address the limitations of previous studies examining emotion regulation in daily life by simultaneously studying several regulation strategies and using the ESM to measure emotion regulation and affect as close to their occurrence as possible.

Regarding the degree to which emotion-regulation strategies were spontaneously employed in daily life, a similar order was found in both studies, with distraction being among the most used strategies, whereas sharing and reappraisal were used least. Suppression was used at an intermediate level. This ordering may reflect the ease with which the different strategies can be implemented in daily life. In addition, the low prevalence of reappraisal may be due to the fact that the use of this strategy may be less accessible for introspection than the other strategies and therefore, less likely to be self-reported. Although these findings provide important descriptive information regarding the spontaneous use of regulation strategies in daily life, future research is needed to reveal the underlying mechanisms. Contextual characteristics may play a substantial role in this regard. Examining the ICCs for our measures of emotion regulation indicated that the largest proportion of variability in regulatory strategies was situated at the within-person level, implying that people may flexibly adapt their use of emotion-regulation strategies depending on situational demands (Cheng, 2001; Sheppes et al., 2011). We found it interesting that, in both studies, the lowest between-person variability was observed for social sharing, suggesting that contextual factors play a large role in the use of sharing. Indeed, previous research has found that personality traits such as neuroticism and extraversion are only weak predictors of social sharing behavior (Luminet, Zech, Rimé, & Wagner, 2000), whereas intensity of the emotion-eliciting event, a situational aspect, is a strong predictor of sharing (Luminet, Bouts, Delie, Manstead, & Rimé, 2000).

In both studies, the within-person correlations between the different regulation strategies were positive. These findings are consistent with research on coping, which has consistently found that when dealing with stress, people tend to make use of several strategies at a time. Also, our findings provide empirical support for assumptions from the process model of emotion regulation, in which it is assumed that different emotion-regulation strategies can be used in parallel (Gross & Thompson, 2007). An important implication for future research may therefore be to investigate or control for different strategies simultaneously, instead of studying emotion-regulation strategies in isolation, to clearly disentangle the antecedents and consequences of different strategies.

Our finding that the use of different emotion-regulation strategies correlated positively between persons is at odds with research using trait questionnaires (John & Gross, 2007). For example, it has been hypothesized that the tendency to suppress feelings would be negatively related to the tendency to share emotions (John & Gross, 2007) but in the present studies, the average use of these two strategies was positively correlated. This divergence of results may be due to the different methods used to obtain information on trait-emotion regulation: In the present studies, this was done by aggregating responses of momentary regulatory behavior, whereas previous studies have mostly relied on retrospective reports. Divergence between global retrospective and momentary assessments is not uncommon (e.g., Schwartz, Neale, Macro, Shiffman, & Stone, 1999; Todd, Tennen, Carney, Armeli, & Affleck, 2004) and likely occurs because people rely on different information when making these two types of assessments (Todd et al., 2004). Moreover, due to memory and other cognitive biases, global retrospective reports may be less valid measures of dispositional regulatory behavior (Schwarz, Kahneman, & Xu, 2009).

Whenever positive correlations are observed between self-report items, such as those found between all emotion-regulation strategies in the current studies, it is important to consider the influence of response biases. Though we can rule out the influence of systematic response biases on the within-person correlations because of person–mean centering (see Model 2 in the Appendix), this is not the case for the between-persons correlations. In fact, response biases may partly account for our finding that emotion-regulation strategies were more strongly associated between persons than within persons across both studies.

Finally, we investigated the reciprocal associations between the use of the different emotion-regulation strategies and affect. First, we investigated whether affect predicted change in the use of the emotion-regulation strategies. We found that NA predicted an increase in the use of each of the emotion-regulation strategies in both studies, whereas PA predicted no change in emotion regulation in Study 1 and a decrease in the use of reflection, rumination, reappraisal, and expressive suppression in Study 2. Taken together, these results show that a person is more likely to use all six emotion-regulation strategies when feeling negative, and suggest that people may be less likely to deploy emotion regulation when feeling positive, further underscoring the primarily hedonistic purpose of emotion regulation.

Second we investigated whether the use of emotion regulation predicted change in NA and PA. Our findings are partially in line with predictions derived from the process model of emotion regulation (Gross, 2007) and with previous studies of emotion regulation, as summarized in recent meta-analyses (Aldao et al., 2010; Webb et al., 2012). First, our findings indicate that, from a hedonic perspective, rumination and suppression are on average maladaptive strategies (i.e., they are associated with increases in negative and decreases in positive feelings). On the one hand, for rumination, our findings are consistent with Webb et al.'s (2012) meta-analysis, in which concentrating on feelings was identified as an ineffective regulation strategy, and also with Aldao et al.'s (2010) meta-analyses, in which rumination was positively correlated with symptoms of psychopathology. On the other hand, for expressive suppression our findings are not consistent with Webb et al.'s meta-analysis of experimental studies, in which expressive suppression appeared to be an effective strategy in general. However,

this effect appeared to be almost entirely driven by the fact that suppression had a large beneficial effect on behavioral measures, whereas it only had a small positive effect on experiential measures (such as self-reported affect), and even had a negative effect on physiological indices of emotion. Our findings are consistent with Aldao et al.'s (2010) meta-analysis, in which expressive suppression was positively associated with symptoms of psychopathology. Combined, this emphasizes the importance of validating lab-based studies with findings observed in real life.

Second, in our studies, some strategies that were assumed to be (hedonically) adaptive appeared to be associated with increases in PA but not with decreases in NA. For example, reflection was related to increases in PA in both studies, as were reappraisal and distraction in Study 2. However, reflection, reappraisal, and distraction were not related to changes in NA in either of our studies. In contrast, Webb et al. (2012) identified these strategies as being moderately effective at altering both PA and NA in experimental studies. To explain this difference between experience-sampling and experimental studies, one may argue that certain strategies may be more effective in the lab than in daily life, because participants typically receive detailed instructions on how to implement a particular strategy in experimental studies. In the current studies, participants received no instructions on how to most effectively employ each regulation strategy, but instead reported how they spontaneously regulated their feelings in daily life. Moreover, in the lab, emotion regulation is applied in a context stripped of the complexities of everyday life. This explanation accords with Webb et al.'s (2012) finding that emotion-regulation strategies were more effective when emotions were induced by pictures or film clips (stimuli that are less personally relevant) than when they were induced by other types of emotion induction, such as failure feedback.

Some evidence for moderation of these effects by gender was found. In particular, in both studies, gender moderated the effect of reflection on PA, in that reflection was associated with an increase in PA for women but not for men. Future studies are needed to replicate and shed light on this finding.

Although the current studies provide important insights into the relative use and impact of several emotion-regulation strategies in daily life, they are not without limitations.

First, the current studies relied exclusively on self-reports to assess the experience and regulation of emotions. Self-reported data are prone to distortion by a number of factors, such as memory biases and social desirability motivations (Schwarz, 1999; Scollon, Kim-Prieto, & Diener, 2003). We were able to avoid some of the problems associated with self-reports (i.e., memory biases) by using the ESM, which reduces the time between experience and assessment. Another shortcoming of relying on self-reports is that we were only able to investigate consciously accessible emotion regulation. However, it is becoming increasingly clear that emotion regulation may often function automatically and outside of conscious awareness (Gyurak, Gross, & Etkin, 2011; Mauss, Bunge, & Gross, 2007). A challenge for future research will be to investigate how automatic regulatory processes shape emotions in everyday life. Second, although one of the strengths of the present studies was the inclusion of a range of different deliberate regulation strategies, our sample of selected strategies was not exhaustive. More strategies exist (e.g., situation selection, situation modification, distancing, acceptance) and future studies should investigate the use and emotional consequences of these strategies as well. Finally, in the absence of information about the situations in which regulation occurred and the goals people were pursuing, we assumed that people generally regulated their emotions hedonically. This seems acceptable in the light of a recent experience-sampling study (Riediger et al., 2009), which revealed that, when people regulate their feelings, prohedonic motivations appear to prevail over contrahedonic motivations. However, emotions can also be regulated for instrumental goals, which do not always coincide with hedonic ones (Parrott, 1993; Tamir, 2009). Studying when and how different regulation strategies are used in the context of everyday goal pursuit is an important avenue for future research.

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(*Appendix follows*)

# Appendix

## Multilevel Equations

### Model 1: Three-Level Model Comparing Mean Emotion-Regulation Scores

Level 1 (item level):

$$\text{Regulation Score}_{itj} = \pi_{0tj} + \pi_{1tj}(\text{distraction\_dum}) + \pi_{2tj}(\text{reappraisal\_dum}) + \pi_{3tj}(\text{reflection\_dum}) + \pi_{4tj}(\text{rumination\_dum}) + \pi_{5tj}(\text{distraction\_dum}) + e_{itj}$$

Level 2 (beep level):

$$\pi_{0tj} = \beta_{00j} + \rho_{0tj}$$
$$\pi_{1tj} = \beta_{10j}$$
$$\pi_{2tj} = \beta_{20j}$$
$$\pi_{3tj} = \beta_{30j}$$
$$\pi_{4tj} = \beta_{40j}$$
$$\pi_{5tj} = \beta_{50j}$$

Level 3 (person level):

$$\beta_{00j} = \gamma_{000} + \mu_{00j}$$
$$\beta_{10j} = \gamma_{100} + \mu_{10j}$$
$$\beta_{20j} = \gamma_{200} + \mu_{20j}$$
$$\beta_{30j} = \gamma_{300} + \mu_{30j}$$
$$\beta_{40j} = \gamma_{400} + \mu_{40j}$$
$$\beta_{50j} = \gamma_{500} + \mu_{50j}$$

The outcome at Level 1(regulation score$_{itj}$), reflecting a person *j*'s score on regulation item *i* at time *t,* was modeled as a function of five dummy variables ($\pi_{1tj}$ . . . $\pi_{5tj}$), each representing an emotion-regulation strategy (e.g., distraction_dum, 1=distraction, 0=not distraction). The Level-1 intercept ($\pi_{0tj}$) therefore reflects the mean score for the sixth regulation strategy (i.e., the reference category). For example, as there is no dummy predictor for suppression in the model above, the value of the Level-1 intercept represents the mean suppression score. The slopes of the five dummy variables represent differences between the mean score for each regulation strategy and the reference category. For example, the slope of the distraction dummy in the model above ($\pi_{1tj}$) represents the difference between the mean distraction score and mean suppression score. At Level 2, only the Level-1 intercept was allowed to vary randomly across beeps, whereas the Level-1 slopes were modeled as fixed effects. Random variation in all parameters across persons was modeled at Level 3. We ran six such models with each regulation strategy as a reference category.

### Model 2: Within-Person Correlations Between Emotion-Regulation Strategies

We calculated within-person correlations between emotion-regulation strategies following Nezlek (2012). For example, the within-person correlation between rumination and distraction was calculated as follows: We first ran an intercept-only model with rumination as the outcome (Model 2a). Next, distraction was included as a group-mean-centered predictor (Model 2b). This allowed us to calculate the reduction in Level-1 error variance in rumination as a function of adding distraction as a predictor. Dividing this reduction in Level-1 variance by the Level-1 error variance of the unconditional model (Model 2a) results in a "percentage of variance explained," which we then converted to a within-person correlation by taking its square root. We repeated these two models using distraction as the outcome and we report the average of the two resulting correlations.

### Model 2a: Unconditional Model Predicting Rumination

Level 1 (beep level):

$$\text{Rumination}_{tj} = \beta_{0j} + \rho_{tj}$$

Level 2 (person level):

$$\beta_{0j} = \gamma_{00} + \mu_{0j}$$

### Model 2b: Predicting Rumination From Distraction

Level 1 (beep level):

$$\text{Rumination}_{tj} = \beta_{0j} + \beta_{1j}(\text{distraction}_t) + e_{tj}$$

Level 2 (person level):

$$\beta_{0j} = \gamma_{00} + \mu_{0j}$$
$$\beta_{1j} = \gamma_{10} + \mu_{1j}$$

(*Appendix continues*)

### Model 3: Two-Level Model Predicting Change in Emotion-Regulation Strategies From Affect

Level 1 (beep level):

$$\text{Regulation}_{tj} = \beta_{0j} + \beta_{1j}(\text{affect}_t) + \beta_{2j}(\text{regulation}_t) + e_{tj}$$

Level 2 (person level):

$$\beta_{0j} = \gamma_{00} + r_{0j}$$

$$\beta_{1j} = \gamma_{10} + r_{1j}$$

$$\beta_{2j} = \gamma_{20} + r_{2j}$$

The outcome at Level 1 ($\text{regulation}_{tj}$), representing a person $j$'s score on one of the six emotion-regulation items at time $t$, was modeled as a function of a random intercept ($\beta_{0j}$); a random slope ($\beta_{1j}$), representing the relationship between a person $j$'s affect (i.e., PA or NA) at time $t$-1 and his or her use of the regulation strategy at time $t$; and a random slope ($\beta_{2j}$), representing the relationship between person $j$'s current use of the regulation strategy and their use at the previous beep ($\text{regulation}_{t\text{-}1}$). Thus, we modeled the degree to which change in a particular emotion-regulation strategy from time $t$-1 to time $t$ was associated with affect at $t$-1. To allow for an interpretation of within-person effects, all Level-1 predictors were group-mean centered, thus removing between-person differences from the level-one parameter estimates (Enders & Tofighi, 2007; Nezlek, 2012). Consequently, the Level-1 intercept ($\beta_{0j}$) represents person $j$'s mean score for a particular regulation strategy (when there was a score of 0 on all other predictors). These Level-1 parameters were allowed to vary randomly across participants at Level 2.

### Model 4: Two-Level Model Predicting Change in Affect From Emotion-Regulation Strategies

Level 1 (beep level):

$$\text{Affect}_{tj} = \beta_{0j} + \beta_{1j}(\text{distraction}_t) + \beta_{2j}(\text{reappraisal}_t) + \beta_{3j}(\text{reflection}_t) + \beta_{4j}(\text{rumination}_t) + \beta_{5j}(\text{sharing}_t) + \beta_{6j}(\text{suppression}_t) + \beta_{7j}(\text{affect}_t) + r_{tj}$$

Level 2 (person level):

$$\beta_{0j} = \gamma_{00} + \mu_{0j}$$

$$\beta_{1j} = \gamma_{10} + \mu_{1j}$$

$$\beta_{2j} = \gamma_{20} + \mu_{2j}$$

$$\beta_{3j} = \gamma_{30} + \mu_{3j}$$

$$\beta_{4j} = \gamma_{40} + \mu_{4j}$$

$$\beta_{5j} = \gamma_{50} + \mu_{5j}$$

$$\beta_{6j} = \gamma_{60} + \mu_{6j}$$

$$\beta_{7j} = \gamma_{70} + \mu_{7j}$$

The outcome at Level 1 ($\text{affect}_{tj}$), representing a person $j$'s affect score at time $t$, was modeled as a function of a random intercept ($\beta_{0j}$), and six random slopes ($\beta_{1j}$ . . . $\beta_{6j}$), representing the relationship between person $j$'s use of a particular emotion-regulation strategy at time $t$ (assessed "since the last beep") and affect. In addition, we included a random slope ($\beta_{7j}$) representing the relationship between person $j$'s current affect and affect at the previous time point ($\text{affect}_{t\text{-}1}$). Thus, we modeled the degree to which change in affect from time $t$-1 to time $t$ (i.e., two consecutive beeps within a day of the experience sampling) was associated with the use of each emotion-regulation strategy (reported as occurring between the two consecutive beeps). To allow for an interpretation of within-person effects, all Level-1 predictors were group-mean-centered, thus removing between-person differences from the Level-1 parameter estimates (Enders & Tofighi, 2007; Nezlek, 2012). Consequently, the Level-1 intercept ($\beta_{0j}$) represents person $j$'s mean level of affect at time $t$ (when there was a score of 0 on all other predictors). These Level-1 parameters were allowed to vary randomly across participants at Level 2. The Level-2 parameter estimates presented in Table 3 and 5 ($\gamma_{00}$ . . . $\gamma_{70}$) represent the average (or fixed-effects) estimates across the sample.

### Model 5: Moderation Models

Level 1 (beep level):

$$\text{Affect}_{tj} = \beta_{0j} + \beta_{1j}(\text{distraction}_t) + \beta_{2j}(\text{reappraisal}_t) + \beta_{3j}(\text{reflection}_t) + \beta_{4j}(\text{rumination}_t) + \beta_{5j}(\text{sharing}_t) + \beta_{6j}(\text{suppression}_t) + \beta_{7j}(\text{affect}_{t-1}) + r_{tj}$$

Level 2 (person level):

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{gender}_j) + \mu_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}(\text{gender}_j) + \mu_{1j}$$

$$\beta_{2j} = \gamma_{20} + \gamma_{21}(\text{gender}_j) + \mu_{2j}$$

$$\beta_{3j} = \gamma_{30} + \gamma_{31}(\text{gender}_j) + \mu_{3j}$$

$$\beta_{4j} = \gamma_{40} + \gamma_{41}(\text{gender}_j) + \mu_{4j}$$

$$\beta_{5j} = \gamma_{50} + \gamma_{51}(\text{gender}_j) + \mu_{5j}$$

$$\beta_{6j} = \gamma_{60} + \gamma_{61}(\text{gender}_j) + \mu_{6j}$$

$$\beta_{7j} = \gamma_{70} + \gamma_{71}(\text{gender}_j) + \mu_{7j}$$

This model is highly similar to Model 4 with the exception that at Level 2, gender (or CES-D) was used to predict variation across participants in the Level-1 random coefficients. In the model using CES-D scores, these scores were grand-mean centered.

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