The efficiency of reappraisal and expressive suppression in regulating everyday affective experiences

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A widespread assumption in research and clinical practice is that cognitive reappraisal is a healthy and successful emotion regulation strategy, while expressive suppression is ineffective and has non-favourable consequences (e.g., decreased positive affect, higher physiological arousal). However, little is known about the consequences of reappraisal and expressive suppression for everyday affect. We investigated affective consequences of habitual reappraisal and expressive suppression in undergraduates (n=87), and sampled affect characteristics for 24 h. Moreover, we quantified affective recovery from viewing an aversive video fragment. Habitual reappraisal was associated with lowered emotional arousal (but not valence), both in terms of diurnal affect levels and positive and negative responses to the emotional provocation task. This pattern contravenes the popular assumption that reappraisal has generally favourable consequences. Additionally, in contrast to the alleged non-favourable consequences of habitual expressive suppression, the current study failed to find a relation between expressive suppression, diurnal affect levels and affective recovery. This suggests that the detrimental effects of expressive suppression are limited in duration. Collectively, our results emphasise that the everyday consequences of emotion regulation for affect merits systematic research, for instance by using more naturalistic and prolonged interventions.

1. Introduction

Emotion serves as a guide for human behaviour and helps to prepare behavioural reactions quickly and in an automatic fashion (Most et al., 2005). However, environmental demands often determine whether an emotion should or should not be expressed or used as a guide for behaviour. To this end, humans are able to alter the strength and direction of their emotional responses (Thompson, 1991; Bonanno et al., 2004) by employing emotion regulation (ER) strategies, reflecting a set of relatively stable, trait-like individual difference variables (Gross and Thompson, 2007).

Researchers and clinicians have been intrigued by potential consequences of individual differences in ER. For instance, Berking et al. (2008) found that ER skills play a key role in emotional disorders, while Garnefski et al. (2002) argued that some ER strategies may be more adaptive than others. So far, the two ER strategies that have received most empirical scrutiny are cognitive reappraisal and expressive suppression (ES). In the ER literature, these strategies have been differentiated on the basis of the emotion-generating system that is targeted (Koole, 2009) and where in the process of emotion-generation regulation occurs (Gross and Thompson, 2007). Accordingly, reappraisal employs knowledge as emotion-generating system by changing cognitions about an emotional situation. Reappraisal occurs even before emotional response tendencies are fully generated. ES, on the other hand, targets bodily responses as emotion-generating system. It diminishes the expression of response tendencies after they have been fully generated (Gross and Thompson, 2007; Koole, 2009).

As to the acute consequences of these ER strategies, it has been demonstrated that reappraisal successfully reduces negative affect and/or increases positive affect (for a meta-analysis, see Augustine and Hemenover, 2009). ES seems to be ineffective. In contrast to reappraisal (but see Lam et al., 2009), it may even produce undesirable effects such as decreased positive affect, increased physiological arousal, or memory impairments (e.g., Hofmann et al., 2009; for a review, see Gross, 2002). In addition to these transient effects, there are indications that reappraisal, but not ES, has favourable long-term consequences for individuals’ well-being or interpersonal functioning (e.g., Haga et al., 2009; John and Gross, 2004). Regarding mental health, more frequent use of ES and less frequent use of reappraisal have been associated with depression, anxiety, and stress-related symptoms after trauma (Joormann and Gotlib, 2010; Amstadter, 2008; Moore et al., 2008; but see Dunn et al., 2009).
Surprisingly little is known about the impact of ER strategies on everyday affective experiences. Cross and John (2003) and Wang et al. (2009) used the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) as a measure of everyday affective experiences and found that habitual reappraisal was associated with generally higher positive and lower negative affect. In addition, experience sampling studies indicate that ES is associated with fewer daily positive events in individuals with elevated social anxiety (Kashdan and Steger, 2006), and with higher daily stigma-related distress in minority groups (Hatzenbuehler et al., 2009). Also, Nezlek and Kuppens (2008) linked reappraisal to increased favourable affective consequences and ES to non-favourable consequences. A potential drawback of the above-mentioned studies is that they either conceptualised ER as a state variable (i.e., focusing on transient effects of ER within subjects) or used only one measurement of affect per day (e.g., mean or evening level per day). Thus, these studies did not establish whether stable individual differences in ER bear consequences for the dynamics of daily affective experiences.

To the best of our knowledge, only Kuppens et al. (2010) recently provided a closer look into habitual ER and the dynamics of daily affect. In two experience sampling studies, these authors investigated the relationship between stable individual differences in ER and daily characteristics of two dimensions of affective experience (i.e., valence and arousal; Barrett and Russell, 1999). Interestingly, habitual reappraisal was found not to be associated with the valence dimension of daily affect; yet it did relate to stronger regulation characteristics on the arousal dimension. ES was related to higher daily arousal levels (Kuppens et al., 2010, Study 1) and to lower valence levels (Study 2).

The current study aimed to provide further insight into the consequences of habitual reappraisal and ES for everyday affective experiences by assessing affect characteristics both during a regular day and during an emotional provocation in a healthy undergraduate sample. More specifically, emotional valence and arousal were sampled across all distinct episodes of an entire day with the Day Reconstruction Method (DRM; Kahneman et al., 2004). The DRM allows for a quantification of diurnal affect characteristics, including variability in affect (i.e., temporal stability), independently for valence and arousal. In addition to linking reappraisal and ES to DRM valence and arousal dimensions, the current study also looked at how these ER strategies relate to the ability to restore positive and negative mood following an emotional provocation task.

Drawing from previous research (e.g., Nezlek and Kuppens, 2008; Kuppens et al., 2010), we expected habitual reappraisal to correlate positively with mean levels and stability of DRM valence. We also anticipated reappraisal to correlate positively with stability but not mean levels of DRM arousal. As to the emotional provocation task, reappraisal was thought to be linked to an increased ability to restore mood levels during recovery (i.e., smaller increases in negative affect and smaller decreases in positive affect). ES was expected to correlate negatively with mean levels and stability of DRM valence as well as with stability of DRM arousal, but positively with mean levels of DRM arousal. ES was also expected to be linked to an impaired ability to restore mood levels in recovering from the emotional provocation task.

2. Methods

2.1. Participants

Eighty-seven undergraduates (57 women) with a mean age of 21.5 (S.D. = 4.0; range: 19–45) voluntarily participated in the current study and in return received partial course credit. All participants were native Dutch speakers and provided written informed consent. The study was approved by the standing ethical committee of the Faculty of Psychology and Neuroscience, Maastricht University.

2.2. Emotion regulation strategies

A Dutch translation (Koole and Jostmann, 2004) of the Emotion Regulation Questionnaire (ERQ; Cross and John, 2003) was used to assess the habitual use of reappraisal (R) and ES. The ERQ consists of a six-item reappraisal subscale (Cronbach’s alpha = 0.85) and a four-item ES subscale (Cronbach’s alpha = 0.79). Examples are “I control my emotions by changing the way I think about the situation I’m in” (reappraisal) and “I keep emotions to myself” (suppression). Participants are required to indicate whether they agree with each statement on a seven-point scale ranging from 1 = strongly disagree to 7 = strongly agree. Reappraisal and ES scores are derived by averaging the item scores. In the present sample, mean reappraisal and ES scores were 3.46 (S.D. = 1.01) and 4.91 (S.D. = 1.19). The subscales did not correlate with one another (r = −0.05 (ns)). There was a significant gender difference in ES, with men relying on ES less often than women by 2.58 points, t(85) = 2.47, p < 0.05. There were no gender differences in the use of reappraisal.

2.3. Diurnal affect

Diurnal affect characteristics were assessed with the Day Reconstruction Method (DRM; Kahneman et al., 2004). The DRM first required participants to write down all distinct episodes of the previous day that they could recall. For each episode, participants indicated the beginning and end time and completed an Affect Grid. The Affect Grid (Russell et al., 1989) reliably assesses emotional valence and arousal on a single-item scale presented as a two-dimensional space made up by nine horizontal points (ranging from unpleasant feelings on the left to pleasant feelings on the right) and nine vertical points (ranging from high arousal at the top to sleepiness at the bottom). Valence and arousal scores can range from −4 to +4. Finally, participants indicated how typical the previous day was for that day of the week on a five-point scale (1 = much worse; 5 = much better).

2.4. Affective response to emotional provocation

2.4.1. Stimuli

Participants were shown a 12 min video fragment from “The Silence of the Lambs” (Segalne, 1991) that has been used in previous studies of our lab (e.g., Giesbrecht et al., 2010). Importantly, the selected fragment steadily increases in tension over time and elicits fearful emotions (Rottenberg et al., 2007). Robust mood effects in these prior studies attest to the usefulness of this video fragment for studying how mood may be influenced by individual differences in ER.

2.4.2. Affect change

Changes in positive and negative affect that outlasted the recovery from the emotional provocation were assessed by means of the state version of the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988), administered immediately prior to the film (i.e., baseline) and immediately following a recovery period of five minutes (i.e., post-measure). The PANAS consists of two 10-item subscales measuring positive affect (PA; Cronbach’s alpha’s > 0.89 in both administrations) and negative affect (NA; Cronbach’s alpha’s > 0.78). Items require participants to rate the extent to which they experienced certain emotions (e.g., PA: interested, NA: distressed) on five-point scales (1 = very slightly or not at all; 5 = very much); PA and NA change scores were determined by subtracting baseline from the post-measure scores, NA scores, but not PA scores, were log-transformed prior to calculating change scores to correct for a strong right-skewed distribution. To facilitate interpretation, the scores reported hereafter represent the untransformed means and standard deviations of the NA change scores.

2.4.3. Habituation and strength of the provocation

In order to address potential habituation effects to the film fragment, participants were asked whether they had previously seen the fragment. Also, participants were asked to indicate the maximum level of fear they had experienced during the film fragment on a 100 mm Visual Analogue Scale (VAS; anchors: 0 = not at all; 100 = very much).

2.5. Procedure

Participants were seated individually at a desk in a soundproof room. First, the DRM was administered, each part being accompanied by extensive written and oral instructions. Next, participants completed the ERQ, followed by a short relaxation phase, and then the baseline PANAS was administered. An automated presentation was started on the computer screen, explaining to the participants that they were about to see an emotionally provoking film clip followed by 5 min of rest. Participants started the presentation of the video fragment themselves by pressing a response button, viewed the film clip, and were then instructed to sit quietly for another 5 min. Importantly, no instructions concerning the regulation...
were evaluated with one-tailed tests. Explorative tests were two-tailed.

ES was unrelated to all DRM affect characteristics.2

and mean level, variability, and temporal stability of valence. correlate significantly with arousal variability or temporal stability,
calculated.

DRM affect characteristics were tested by computing Pearson's correlation coeffi-
cient for valence and arousal by calculating mean levels across all
reported episodes for each participant. Moreover, standard deviations across all
episodes were used as indexes of variability, and mean squared successive
differences (MSSDs) across all episodes were derived to estimate temporal stability
(Ehner-Pfiemer et al., 2009). Linear associations between the ERQ subscales and the
DRM affect characteristics were tested by computing Pearson’s correlation coeffi-
cients. Likewise, linear associations between the ERQ subscales and PA and NA change scores in response to the emotional provocation were tested. Also, Pearson correlations between the ERQ subscales and maximum fear VAS scores were calculated. \( P \)’s < 0.05 were considered statistically significant; A priori hypotheses were evaluated with one-tailed tests. Explorative tests were two-tailed.

2.6. Statistical analysis

In order to assess affect changes, baseline and post-measure PA and NA scores were compared by means of paired-samples t-tests. DRM data were summarised independently for valence and arousal by calculating mean levels across all reported episodes for each participant. Moreover, standard deviations across all episodes were used as indexes of variability, and mean squared successive differences (MSSDs) across all episodes were derived to estimate temporal stability (Ehner-Pfiemer et al., 2009). Linear associations between the ERQ subscales and the DRM affect characteristics were tested by computing Pearson’s correlation coefficients. Likewise, linear associations between the ERQ subscales and PA and NA change scores in response to the emotional provocation were tested. Also, Pearson correlations between the ERQ subscales and maximum fear VAS scores were calculated. \( P \)’s < 0.05 were considered statistically significant; A priori hypotheses were evaluated with one-tailed tests. Explorative tests were two-tailed.

3. Results

3.1. DRM diurnal affect

Participants recalled on average 14.9 episodes of the previous day (S.D. = 4.4; range: 6–25). Most participants indicated that the previous day was rather typical for that day of the week; only 11 (12%) said that the previous day was “much worse” or “much better” than usual. A summary of the diurnal affect characteristics is reported hereafter. No significant partial correlations were revealed.

Table 1

Table 1 Raw descriptives of the Diurnal Affect Characteristics assessed with the Day Reconstruction Method \( (n=85) \).

<table>
<thead>
<tr>
<th>Diurnal Affect Characteristic</th>
<th>Mean</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean level</td>
<td>0.96</td>
<td>0.79</td>
</tr>
<tr>
<td>Variability</td>
<td>1.82</td>
<td>0.49</td>
</tr>
<tr>
<td>Stability</td>
<td>5.42</td>
<td>2.71</td>
</tr>
<tr>
<td>Arousal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean level</td>
<td>0.18</td>
<td>0.77</td>
</tr>
<tr>
<td>Variability</td>
<td>2.02</td>
<td>0.43</td>
</tr>
<tr>
<td>Stability</td>
<td>5.94</td>
<td>3.67</td>
</tr>
</tbody>
</table>

Note: mean level refers to the individual average scores, variability to individual standard deviations, and stability to individual mean squared successive differences across all episodes of the assessed day; S.D.—standard deviation.

of emotions were given as we were interested in the habitual use of ER strategies. After the 5 min recovery period, the post-measure PANAS was administered followed by querying participants about their prior knowledge of the film fragment and administering the fear VAS.

3.1. DRM diurnal affect

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3.2. Emotional provocation

3.2.1. Effects of the provocation

On average, participants reported a maximum fear score of 41.0 on the VAS (S.D. = 28.0; Range: 0–92). With respect to mood changes, average PA remained unchanged in the whole sample, \( t(86) = 0.57 \) (ns), Mean\( \text{Difference} = 0.2 \) (S.D. = 3.18). Meanwhile, NA increased significantly from baseline to post-measure, \( t(86) = 2.18, p < 0.05 \), Mean\( \text{Difference} = 0.67 \) (S.D. = 3.03). About half of the sample \( (n = 45) \) indicated that they had previously seen the film fragment that was used for the emotional provocation. In order to assess whether PA and NA changes were influenced by familiarity with the film, two (Time: baseline, post-measure) by two (Group: seen, not seen) repeated measures ANOVAs were performed separately for PA and NA. No interaction between PA change and familiarity with the film fragment was found, \( F(1, 85) = 0.26 \) (ns). However, a significant interaction effect for NA change emerged, \( F(1, 85) = 5.37, p < 0.05 \). Paired samples t-tests in the two subgroups showed that NA increased for participants who had never before seen the fragment \( (n = 42) \), \( t(41) = 2.93, p < 0.01, \text{Mean}\( \text{Difference} = 1.45 \) (S.D. = 3.27), while remaining unchanged in those who had seen the film fragment previously \( (n = 45) \), \( t(44) = 0.01 \) (ns). Familiarity with the film fragment did not affect the reported maximum fear level on the fear VAS, \( t(85) = 0.92 \) (ns).

3.2.2. Impact of emotion regulation on affect change

Correlational analyses revealed statistically significant negative correlations between reappraisal and PA \( (r = -0.24, \text{two-tailed} p = 0.05) \) as well as NA \( (r = -0.30, \text{one-tailed} p = 0.01) \) change scores. Suppression was statistically unrelated to the PANAS change scores. Maximum fear did not correlate with reappraisal, while a positive correlation with ES was found \( (r = -0.20, \text{one-tailed} p = 0.05) \).

Using two-tailed tests of significance, the correlation analyses were repeated separately for participants who had and those who had not seen the film before. The associations between reappraisal and PA change and NA change were carried by participants who recognised the film fragment \( (PA: r = -0.36, p < 0.05; NA: r = -0.38, p < 0.05) \) and were non-significant in participants who did not know the fragment \( (PA: r = -0.11, \text{ns}; NA: r = -0.25, p = 0.11) \). A significant positive association between ES and maximum fear was found for participants who recognised the film fragment \( (r = 0.32, p < 0.05) \), but not for those who did not know the film \( (r = 0.06 \text{ (ns)}) \).

4. Discussion

To date, only few studies have investigated the potential role of habitual ER in everyday affective experience. Using two
independent paradigms, we investigated the link between aspects of everyday affective experience and the habitual use of cognitive reappraisal and ES. The main findings can be summarised as follows. First, no association was found between reappraisal and any of the diurnal characteristics of valence assessed with the DRM. There was, however, a moderate negative correlation between reappraisal and diurnal emotional arousal mean levels. Second, in the recovery from the emotional provocation, reappraisal predicted both lower change scores of NA and lower change scores of PA. However, associations between reappraisal and change in PA and NA were only significant in participants who were familiar with the fragment. Third, regarding the effect of the habitual use of ES, the results showed no association between ES and diurnal characteristics of valence, and no association between ES and diurnal characteristics of arousal on the DRM. Finally, no influence of habitual ES on PA or NA change scores after the emotional provocation was found, but ES predicted higher maximum fear ratings. Post-hoc analyses showed that this association with higher maximum fear ratings was only evident for those participants who were familiar with the film fragment.

4.1. Consequences of habitual reappraisal

The assumption that cognitive reappraisal is generally associated with favourable affective experiences was not supported unambiguously by our findings. That is, none of the DRM valence parameters was related to reappraisal. Instead, reappraisal was associated with lower mean DRM arousal, irrespective of participants’ valence scores. In the emotional provocation task, on the other hand, habitual reappraisal was associated with a buffered increase in negative affect after recovery from the emotional provocation. This is consistent with previous studies that used emotional provocation tasks (Augustine and Hemenover, 2009). These studies also found that reappraisal goes along with an enhanced ability to recover from negative affective provocations. However, in our study, reappraisal additionally predicted smaller increases in PA. Thus, reappraisal seemingly helps reducing NA at the cost of lowering the experience of positive emotion.

A possible explanation for this pattern lies in the factor structure of PA and NA. In a circumplex model of affect consisting of valence and arousal dimensions (Barrett and Russell, 1999), the PA scale is regarded as aroused positive affect and the NA scale as aroused negative affect. Therefore, a simultaneous decrease of PA and NA, as we observed in those scoring high on reappraisal, can be interpreted as a decrease in affective arousal. Since reappraisal was also associated with lower diurnal levels of emotional arousal, we provide converging evidence from two paradigms for this interpretation. Interestingly, this interpretation is also in line with the recent Kuppens et al. (2010) study, which showed a positive relationship between habitual reappraisal and arousal regulation. Our line of argumentation concurs with Kuppens et al.’s conclusion that the effects of reappraisal on affect might be limited to the arousal component of affective experience.

The post-hoc analyses for participants who were familiar with the film fragment and those who were not yielded some interesting additional findings. During the provocation, participants who recognised the film fragment had more contextual information at their disposal (e.g., they knew already how the scene would end), which may have facilitated changing the cognitive interpretation of the fragment. Alternatively, familiarity might have led to anticipation of fearful reactions, leading to a more pronounced engagement in ER processes. Both possibilities would dictate that the impact of cognitive ER strategies is more pronounced in the group that was familiar with the film. This was indeed the pattern that we found. Moreover, participants who recognised the film did not show an increase in NA due to the provocation, suggesting that this subgroup effectively regulated their emotions, which can in part be attributed to the habitual use of reappraisal.

4.2. Consequences of habitual expressive suppression

The current study found no support for the assumption that the habitual use of ES is associated with less favourable consequences for affective experiences. For instance, the present study failed to observe any relationship between habitual ES and daily affect characteristics. This contradicts some earlier studies that have related suppression to reduced general PA and increased general NA (e.g., Gross and John, 2003; but see Wang et al., 2009). In the emotional provocation task, on the other hand, ES was only related to higher maximum fear levels. The absence of ES effects on PA and NA change scores might be accounted for by the fact that affect was measured after five minutes of recovery instead of directly after the provocation, tapping more pervasive changes rather than acute changes. That is, our findings suggest that ES does not have any notable consequences for affective experiences outlasting the recovery period. This might also explain the absence of associations with DRM affect characteristics. Additional support for this interpretation stems from Kuppens et al. (2010), who found an association between ES and lowered valence in a four-days experience sampling study with 50 observations per day, but not in a two-weeks study with just 10 observations per day. The former, but not the latter study, might have captured valence fluctuations in response to minor daily stressors. Notable is also that Kuppens et al. found higher arousal levels associated with ES in the latter, but not in the former study, which they interpreted as evidence that habitual ES might influence weekly rather than daily patterns of arousal levels. In this sense, our study confirms the view that ES has no global influence on daily arousal characteristics.

The additional analyses for participants who were and who were not familiar with the video fragment suggest that ES had a negative short-term effect for some participants only. In particular, in participants with knowledge of the film, ES correlated with maximum subjective fear. Theoretically, a similar correlation would be expected in the other subgroup, as there is no obvious link between habitual ES and responding to familiar vs. unfamiliar material. Again, one possibility is that familiarity led to an anticipation of a fearful reaction, and this might have mediated the effect of ES on fearful responding. In any case, these findings suggest that the role of cognitions in ES may have to be reconsidered.

4.3. Alternative interpretations

About half of the participants were familiar with the film material used in the emotional provocation. This made it possible to perform post-hoc comparisons in which familiarity with the film fragment was treated as a dichotomous variable. Obviously, from a methodological point of view, such non-planned comparisons are far from ideal. For instance, the compared groups might differ from each other on other aspects that are relevant to ER (e.g., general seeking of emotional stimulation). Alternatively, the absence of NA change in those who were familiar with the film might indicate that these participants were habituated to the material, and might therefore have been less motivated to regulate emotions. However, in terms of maximum fear responding, the strength of the provocation was moderate in the whole sample and was not affected by familiarity with the film fragment. This suggests that the two subgroups did not differ in their levels of habituation or in the need to regulate emotions, although these possibilities cannot be ruled out entirely.
That aside, it seems fruitful to further investigate the role of contextual information in the effects of ER strategies. For instance, future studies might want to address this directly in a controlled manipulation of contextual information. Likewise, the role of fear anticipation as possible mediator of ER effects on affect might be a promising target for future research. In sum, our post-hoc results suggest that future research should try to understand the circumstances in which cognitive reappraisal has beneficial consequences. The consequences of ES might turn out to depend more on contextual information than previously thought.

A noteworthy observation was that women were found to rely on ES more often than men in the present sample. Prior findings suggest that women tend to use all emotion regulation strategies more often than men (e.g., Nolen-Hoeksema and Aldao, 2011), with the exception of ES, which was found more often in men than in women (Melka et al., 2011). It is unclear what the reason for this disparity of findings may be, and whether gender might be a mediating factor in the effects of ER on affective experiences. Future research to address these questions is warranted.

4.4. Limitations

The following limitations deserve to be mentioned. To begin with, the sample only consisted of university students who might be exposed to emotional stressors to a lesser extent than other groups in the general population, and consisted of a relatively high-functioning group. Furthermore, although psychological complaints were not systematically assessed, such complaints may have been present and thus may have influenced the results of this study. Other limitations of our study concern the methods used for the assessment of affect characteristics. For instance, our conclusions are generally limited by the use of retrospective reports of affect. Also, a possible critique is that the DRM assesses diurnal affect characteristics retrospectively in a single session. Nevertheless, the quality of DRM data has been shown to be comparable to experience sampling data in avoiding memory distortions (Kahneman et al., 2004). A limitation of our emotional provocation task is that we assessed peak emotional responding only retrospectively with aVAS, in order to avoid interference with the uninstructed ER process. Consequently, we are not able to thoroughly disentangle emotional responding from ER, i.e. the time course of affective responding. Although this was not the focus of our study, we cannot rule out that our results were influenced by individual differences in affective responding (e.g., Larsen and Ketelaar, 1991). Likewise, we cannot rule out that the results may have been moderated by individual differences in the motivation to regulate emotions. Finally, it is also notable that we used a fear induction as emotional provocation, implying that our conclusions are generally limited by the use of introspective measures of affect. It might have less severe consequences for everyday life than previously thought and, at the same time, emphasise the importance of solidifying and further extending our knowledge about the consequences of cognitive reappraisal and ES for everyday affective experiences.

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