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Emotion regulation patterns: Capturing variability and flexibility in emotion regulation in an experience sampling study

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Variability and flexibility in emotion regulation (ER) are considered important ingredients in adaptive ER. Few attempts at operationalizing variability and flexibility in ER have been made. In two 10-day experience sampling studies ($N = 51$ and 39), healthy participants rated their momentary emotions and their ER efforts in response to those emotions. We evaluated the association between ER (i.e., *between* and *within* ER strategy variability and ER flexibility, operationalized as putatively adaptive, putatively maladaptive and total strategies) and measures of well-being (psychological distress, satisfaction with life) in general (person-level) and in everyday life (day-level). Higher within-variability indicated that a strategy was used more at some occasions and less at others. Higher between-variability indicated variation in the extent to which different strategies were engaged at the same time point. Overall, results were mixed, but in some instances, indicators of ER variability and ER flexibility were related to each other and measures of well-being differently. Total *within* ER variability was negatively associated with well-being at the person and day level. Putatively adaptive *between* and *within* ER variability were associated with less well-being at the person level. At the day level, putatively adaptive and maladaptive *between* ER variability and maladaptive *within* ER variability were negatively associated with well-being. Putatively adaptive ER flexibility was negatively associated with satisfaction with life. This study adds to the literature on indicators of variability and flexibility in ER and their potential adaptiveness. The results indicate that variability in ER could be a maladaptive property, but more research is needed to understand this in terms of putatively adaptive and maladaptive strategies. Future studies on the adaptiveness of these indicators should obtain more contextual information.

Key words: Adaptive emotion regulation, emotion regulation flexibility, experience sampling, emotion regulation variability.

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INTRODUCTION

Theoretical and empirical attention has been paid to the question of how to regulate emotions in the most adaptive way (Aldao, Nolen-Hoeksema & Schweizer, 2010; Blanke, Brose, Kalokerinos, Erbas, Riediger & Kuppens, 2019; McMahon & Naragon-Gainey, 2019). Emotional reactions are not always adaptive (Gross, 1998; Kashdan & Rottenberg, 2010), and it is therefore important that the individual is able to evaluate and regulate their emotions to ensure that their goals are met in an appropriate and adaptive manner. As such, the ability to regulate emotions is thought to play a crucial role in healthy functioning (e.g., Barrett & Gross, 2001; Erbas, Ceulemans, Lee Pe, Koval & Kuppens, 2014; Kashdan & Rottenberg, 2010).

Defining adaptive emotion regulation

Emotion regulation (ER) describes the processes that affect *which* emotions are generated, *when* these emotions arise, and *how* the individual experiences and expresses these emotions (Gross, 2014). Much heterogeneity exists concerning how adaptive ER has been understood and thus operationalized (Aldao, Sheppes & Gross, 2015; Cheng, Lau & Chan, 2014; Southward, Sauer-Zavala & Cheavens, 2021). Research throughout the 1990s and 2000s proposed that some ER strategies were more adaptive than others. For example, emotion suppression was generally considered a maladaptive strategy,

whereas reappraisal and emotion expression were considered adaptive (Aldao & Nolen-Hoeksema, 2010; Gross & John, 2003). Today, some researchers recognize that ER strategies are not inherently adaptive or maladaptive in and of themselves. Indeed, in a given situation, emotion suppression may be more adaptive than emotion expression (e.g., suppressing laughter when recalling something funny at a funeral; Bonanno & Burton, 2013; Bonanno, Papa, Lalande, Westphal & Coifman, 2004; Webb, Miles & Sheeran, 2012). However, although an ER strategy in a specific situation may not inherently be either adaptive or maladaptive, the individual's habitual use of certain strategies does appear to be more or less associated with healthy functioning (Aldao *et al.*, 2010; Aldao & Nolen-Hoeksema, 2012; Ford, Gross & Gruber, 2019; McMahon & Naragon-Gainey, 2019; Naragon-Gainey, McMahon & Chacko, 2017). This has led researchers to distinguish between putatively adaptive and maladaptive ER strategies (Aldao & Nolen-Hoeksema, 2010, 2012; Southward, Altenburger, Moss, Cregg & Cheavens, 2018). For instance, the habitual use of strategies such as experiential avoidance and suppression have been associated with psychopathology (Aldao *et al.*, 2010; Hayes *et al.*, 2004; Kalokerinos, Erbas, Ceulemans & Kuppens, 2019). On the contrary, empirical work indicates that high levels of habitual employment of reappraisal is associated with positive outcomes (Aldao & Nolen-Hoeksema, 2010, 2012; Gross & John, 2003; McMahon & Naragon-Gainey, 2019). Such findings could be interpreted in different ways. They could be said to reflect the inherent toxic nature of such strategies, speaking against the idea

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that no ER strategy in and of itself is (mal)adaptive. A different view, although not necessarily in opposition, is that studies finding negative effects of habitual use of certain strategies may actually pertain to a lack of variability or inflexibility (Aldao *et al.*, 2015). Indeed, many consider *variability* in ER and the *flexible* use of ER strategies adjusted to the context and personal goals to be adaptive (Aldao *et al.*, 2015; Bonanno & Burton, 2013; Gross, 2015; Sheppes, Scheibe, Suri & Gross, 2011). An overreliance on certain strategies, that is, a lack of variability, could reflect a limited repertoire of ER strategies. Moreover, as individuals likely find themselves in varying situations with varying contextual demands over time, it could be argued that the habitual use of a strategy may point to a lack of contextual calibration.

Given these divergent accounts, we take two approaches to investigating ER strategies in the present paper and evaluate whether ER variability and flexibility are adaptive when assessed across: (1) all ER strategies; and (2) putatively adaptive and maladaptive strategies, separately.

ER variability

One prominent prerequisite for adaptive ER has been proposed to be the ability to vary one's use of ER strategies across different contexts (i.e., Aldao *et al.*, 2015; Aldao & Nolen-Hoeksema, 2012; Blanke *et al.*, 2019). This ability has been termed *ER variability* and is a measure of the ability to use various strategies, with different levels of employment, that is, fluctuations in a person's ER strategy usage. ER variability has been conceptualized by discerning *within* variability from *between* variability (Aldao *et al.*, 2015; Blanke *et al.*, 2019). *Within* variability reflects variation in the intensity of a single strategy employed across measurement occasions (cf. Blanke *et al.*, 2019), and *between* variability reflects the selection of a strategy from a pool of strategies at one assessment point (cf. Blanke *et al.*, 2019). Thus, higher within-variability scores indicate that the individual uses a strategy (e.g., reappraisal) more at some occasions and less at others, while higher between-variability scores indicate that there is variation in the extent to which different strategies (e.g., reappraisal, decentering, non-reactivity) are engaged at the same time point (i.e., the individual engages some strategies much more than others at a given time point). Blanke *et al.* (2019) found that *between* variability at the person level and moment level was associated with lower levels of negative affect. However, they found mixed results regarding the degree to which *within* variability was associated with reduced negative affect. Specifically, they identified a weak, negative association between *within* ER variability and negative affect, but only when controlling for depressive symptoms. Following Blanke *et al.* (2019), we investigate both *within* and *between* variability.

Aldao *et al.* (2015) have argued that ER variability is a necessary but not sufficient ingredient in adaptive ER. A person can have high levels of *within* ER variability if using some strategies excessively at some points throughout the day and not at all at other points, but have a hard time distinguishing between strategies and applying them independent of each other. This may make it difficult for the person to regulate their emotions in a context-sensitive way (e.g., the person may not be able to

distinguish between distraction and experiential avoidance leading them to consistently apply both when the context calls for only one of them). Hence, when investigating adaptive ER, it may be important to consider other indicators than ER variability.

ER flexibility

It has been argued that flexible ER pertains to the ability to employ ER strategies *independent* of each other across contexts (Aldao *et al.*, 2015). Such independence or non-convergence of strategies is not captured by ER variability, where an individual can fluctuate a lot in their strategy usage (high ER variability) but consistently use the same strategies to the same extent (low ER flexibility). Aldao *et al.* (2015) point out that ER flexibility is adaptive when considered in relation to variations in the situation. Based on the assumption that situations change from moment to moment and day to day, a correlation or consistency between ER strategies themselves over time would imply a lack of flexible use. This logic follows the operationalization of other emotion dynamics such as emotion differentiation. Here, a nuanced emotional experience is also indicated by a lack of correlation or consistency between emotions over time (Kashdan, Barrett & McKnight, 2015; O'Toole, Renna, Elkjær, Mikkelsen & Mennin, 2020; Thompson, Liu, Sudit & Boden, 2012). It appears that no research to date has made direct empirical attempts at capturing ER flexibility. In our operationalization we look to Aldao *et al.* (2015) theoretical formulation of independence in ER strategy use and to the literature on *emotion differentiation* (O'Toole *et al.*, 2020). We look to literature on emotion differentiation because it is typically operationalized as the (non)convergence between ratings of positive or between ratings of negative emotions and viewed as an ability to flexibly respond to situations (Demiralp, Thompson, Mata *et al.*, 2012; Erbas *et al.*, 2014; Gohm & Clore, 2000; Grünh, Lumley, Diehl & Labouvie-Vief, 2013; Smidt & Suvak, 2015). There is overwhelming evidence for the association between negative emotion differentiation and well-being (e.g., Berenbaum, Raghavan, Le, Vernon & Gomez, 2003; Gohm & Clore, 2000; Grünh *et al.*, 2013; Kashdan *et al.*, 2015), as well as behavioral adaptation (for a review see O'Toole *et al.*, 2020). Mirroring the literature concerning emotion differentiation, we employed an operationalization of ER flexibility as the non-convergence of ER strategies.

Person- and day-level assessment

Most often, ER has been investigated using laboratory experiments or retrospective reports (e.g., Birk & Bonanno, 2016; Bonanno *et al.*, 2004; Cheng, 2001). However, recently ER research has employed experience-sampling methodology (ESM; real-time assessment at multiple time points in different contexts; Blanke *et al.*, 2019; Kalokerinos *et al.*, 2019) because this method enables an investigation of *within*-person moment-to-moment changes, while reducing the risk of recall bias (Csikszentmihalyi & Larson, 2014; Kashdan *et al.*, 2015; Kuppens & Verduyn, 2017). In past research, ER and various indicators of ER have typically been studied at the person (trait) level, relying on the assumption that they can be considered a matter of relatively stable individual differences (e.g., Erbas

et al., 2014, 2018, 2019; Houben, Van Den Noortgate & Kuppens, 2015; Kashdan *et al.*, 2015). However, recent contributions to the literature have argued that these indicators hold both a stable and a variable component (Erbas *et al.*, 2018), that is, a component that can be considered a person- and a day-level matter, respectively. For instance, Erbas *et al.* (2018) reported large day-to-day variation in emotion differentiation, and that differentiation predicted stress at the day level, but not at the person level. Their results thus underline the importance of considering this variable, state-dependent component. Accordingly, Blanke and colleagues analyzed ER variability at both levels, recognizing that deviations from an individual's mean (i.e., state dependent, variable part) in ER variability may reflect an important component of ERV. However, at the moment level, the results supported their conclusions for *between* variability, in that *between* ER variability was negatively associated with negative affect at both levels. Aligning with these recent contributions to the literature, in the present study, we assess ER variability and ER flexibility at two levels, recognizing that there may be deviations from an individual's mean. We operationalize variability both at the person level (across all measurements) and for each day (across daily measurements) and refer to this as the "day level."

The present studies

Replicating and extending recent work on ER variability (Blanke *et al.*, 2019), we explored both ER variability (both *within* and *between* ER strategies) and a new indicator of ER flexibility, and their association with each other and with well-being.

In two experience-sampling studies, participants were asked to rate both emotions and ER efforts three (i.e., Sample 1) or four (i.e., Sample 2) times a day for 10 days. Variability was operationalized as *within* and *between* ER variability and flexibility in ER was operationalized as independent ER use (i.e., ER flexibility). Given the divergent conceptualizations of the adaptiveness of specific ER strategies within the field, separate indicators were calculated for putatively maladaptive, putatively adaptive, and total ER strategies both at the day and the person level.

Specifically, at both the person and day level, we evaluated: (1) how ER variability and ER flexibility were associated with each other; and (2) how ER variability and ER flexibility were associated with well-being, considered across all strategies, and individually for putatively adaptive and putatively maladaptive strategies.

METHODS

The authors state that this study complied with ethical regulations, including obtaining informed consent from participants and data protection.

Participants and procedures

Sample 1 consisted of 51 healthy adults and Sample 2 consisted of 40 healthy adults from the Danish population.¹ Participants had to be above the age of 18 years and proficient in the Danish language. Upon receiving written information about the study, underscoring that participation was voluntary and without any consequences if participants dropped out, written consent was obtained. Based on power calculations, 40 participants would reveal a statistically significant effect of a medium magnitude

($r = 0.40$) to be significant at $\alpha = 0.05$ and $\beta = 0.20$ at the person level in a regression analysis with two predictors. After completing a baseline questionnaire, an experience-sampling study was conducted. Participants received three (Sample 1) or four (Sample 2) text messages every day for 10 days containing links to an online questionnaire. The text messages were sent at random times between 10 am and 9 pm. Participants were instructed to check their phone regularly and answer as many prompts as possible. Participants were compensated with a gift voucher (250 DKK/app. 40 USD).

Measures

Baseline, person-level measures of mental health. Psychological distress was assessed with the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983, Sample 1 $\alpha = 0.79$ /Sample 2 $\alpha = 0.83$) and satisfaction with life was measured with the Satisfaction With Life scale (SWLS; Diener, Emmons, Sem & Griffin, 1985, $\alpha = 0.88/0.77$). In addition, baseline negative affect was measured with seven negative emotion words (i.e., guilty, ashamed, nervous, sad, disgusted, angry, frustrated), and positive affect was measured with seven positive emotion words (i.e., happy, appreciative, satisfied, amused, curious, proud, enthusiastic). These emotion categories are often used in experience sampling studies (e.g., Demiralp *et al.*, 2012; Kashdan *et al.*, 2015; Kashdan & Steger, 2006; O'Toole, Jensen, Fentz, Zachariae & Hougaard, 2014). Each emotion was rated on a five-point Likert Scale.

Baseline, person-level measures of emotion regulation. Eight ER strategies were included for validation purposes of the daily items. Of the putatively adaptive strategies, *reappraisal* was evaluated with the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003, $\alpha = 0.63/0.89$), *decentering* with the Experiences Questionnaire (EQ; Fresco *et al.*, 2007, $\alpha = 0.83/0.88$), *non-reactivity* with the non-reactivity subscale of the Five Facet Mindfulness Questionnaire (FFMQ; Baer, Smith, Lykins *et al.*, 2008, $\alpha = 0.89/0.90$), and *reflection* with the Reflection and Rumination Questionnaire (RRQ; Trapnell & Campbell, 1999, $\alpha = 0.94/0.90$). Of the putatively maladaptive strategies, *expressive suppression* was measured with the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003, $\alpha = 0.79/0.78$), *experiential avoidance* with the experiential avoidance subscale of the Acceptance and Action Questionnaire (AAQ; Bond & Bunce, 2003, $\alpha = 0.56/0.55$), *worry* with the Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger & Borkovec, 1990, $\alpha = 0.89/0.83$), and *rumination* with the Reflection and Rumination Questionnaire (RRQ; Trapnell & Campbell, 1999, $\alpha = 0.93/0.93$).

Day-level measures. *Daily ER* was measured with items reflecting the eight strategies measured at baseline. The different strategies were chosen based on: (1) obtaining an equal number of putatively adaptive and maladaptive strategies; and (2) typically investigated ER strategies (Aldao *et al.*, 2010). Specifically, each strategy was evaluated with two items. These were chosen based on their factor loadings in previous validation studies, choosing the items with the highest factor loading that at the same time could be meaningfully repeated within a daily context. This strategy aligns with previous ESM studies (cf. Kashdan & Steger, 2006; O'Toole, Zachariae & Mennin, 2017), and the specific items chosen have been found to show acceptable internal consistency over time (O'Toole *et al.*, 2021). All items were rated on a five-point Likert Scale and changed into present tense to assess the extent to which the strategy was employed in the *present moment*. The items included.

Daily putatively adaptive emotion regulation strategies. Reflection: "I am exploring my 'inner' self" and "I am looking at my life in a philosophical perspective" (RRQ; Trapnell & Campbell, 1999). Reappraisal: "I am changing the way I am thinking of the situation" and "I am changing the way I am thinking of my feelings" (ERQ; Gross & John, 2003). Distance: "I am treating myself kindly" and "I am observing my feelings without being drawn into them" (EQ; Fresco *et al.*, 2007). Non-reactivity: "I am perceiving my feelings and emotions without having to react to them" and "I am noticing thoughts or images without reacting" (FFMQ; Baer *et al.*, 2008).

Daily putatively maladaptive emotion regulation strategies. Worry: “My worries are overwhelming me” and “I am worrying and can’t stop worrying” (PSWQ; Meyer *et al.*, 1990). Rumination: “I am ruminating over or dwelling on things that are happening to me” and “I’m playing back over in my mind how I acted in a past situation” (RRQ; Trapnell & Campbell, 1999). Expressive suppression: “I am controlling my emotions by not expressing them” and “I am keeping my emotions to myself” (ERQ; Gross & John, 2003). Experiential avoidance: “I am afraid of my feelings” and “I am trying to suppress thoughts and feelings that I don’t like by just not thinking about them” (AAQ; Bond & Bunce, 2003).

Daily well-being outcomes assessed included negative affect and positive affect, measured with the same seven negative and seven positive emotion words used at baseline (e.g., Demiralp *et al.*, 2012; Kashdan *et al.*, 2015; Kashdan & Steger, 2006; O’Toole *et al.*, 2014). For each emotion, participants rated the degree to which it reflected the way they felt at that point of the day on a five-point Likert Scale. Daily satisfaction with life was only assessed in Sample 1, where participants answered two items pertaining to a short five-item satisfaction with life scale (SWLS; Diener *et al.*, 1985; Kobau, Snizek, Zack, Lucas & Burns, 2010) at each prompt.

Indicators of variability and flexibility in emotion regulation. Data from momentary measures were used to calculate the following indicators: *Within emotion regulation variability* (within ER variability), *between emotion regulation variability* (between ER variability), and *emotion regulation flexibility* (ER flexibility).

Variability indicators. Within and between variability indicators were calculated using standard deviations (SD; cf. Aldao *et al.*, 2015). To obtain variability indicators, we used the same formula as Blanke and colleagues (2019), also calculating mean degree of endorsement. We calculated and defined the variability variables in relation to the person’s mean, meaning that variability findings are over and above effects of mean levels of strategy use at a given occasion or across time points. Between and within variability indicators were calculated for putatively adaptive ER strategies, putatively maladaptive ER strategies, and all ER strategies. We calculated variability indicators both at the day level (i.e., across measurement occasions within a specific day) and the person level (i.e., across all measurement occasions).

Flexibility indicators. ER flexibility indicators were obtained by calculating the consistency between correlations between strategies of putatively adaptive strategies, putatively maladaptive strategies and all strategies across assessment points for each person (cf. Erbas *et al.*, 2018). These indicators illustrate the convergence between strategies over time with higher scores suggesting lower differentiation (i.e., the person does not distinguish well between strategies). Directly following research on emotion differentiation (Erbas *et al.*, 2018), we calculated the intra-class correlation coefficients (ICC). We excluded negative ICC’s because these values are unreliable.² We then transformed the remaining ICC’s using a Fisher’s Z transformation because ICC’s are not normally distributed (cf. Barrett, Gross, Christensen & Benvenuto, 2001). To ease the interpretation of the indicators, we then reversed the Z-transformed ICC’s, such that higher values indicate better differentiation. We calculated differentiation (i.e., flexibility) indicators both at the day level (i.e., across measurement occasions within a specific day, cf. Erbas *et al.*, 2018) and at the person level (i.e., across all measurement occasions, cf. Kashdan, Ferrisizidis, Collins & Muraven, 2010).

Average ICCs at the person level were calculated for each individual (*i*) using the formula below, where MS_R = mean square for rows and MS_E = mean square for error (cf. Koo & Li, 2016), t = measurement occasion, N = number of measurement occasions, s = number of strategies that can be endorsed and X_{sti} = the of strategy use at measurement occasion t for the individual, i :

$$ICC \text{ person level}_i = \sum_{t=1}^{N_1} \frac{MS_R - MS_E}{MS_R} X_{sti}.$$

ICCs at the day level were calculated for each individual using the same formula, but averaging across ICCs within days (i.e., for 3 and 4 assessment points in Sample 1 and 2, respectively).

Statistical analysis

Following recommendations from Erbas *et al.* (2018) of considering both stable and variable components, we conducted two types of analyses. First, regression analyses were conducted to investigate the relationship between person-level indicators (i.e., one score per participant obtained by evaluating all measurement occasions) and well-being outcomes at baseline (i.e., one score per participant). Effect sizes were expressed as Pearson’s r , with 0.1, 0.3 and 0.5, denoting a small, medium, and large effect size, respectively (Cohen, 1988).

Multilevel analyses were conducted with random effects for both the intercept and slope to assess associations between person mean-centered day-level indicators (i.e., daily deviations from the person’s own mean) and day-level well-being variables. For these models, day-level indicators (i.e., within variability, between variability, and flexibility for each day) were nested in individuals with day-level ER variability or day-level ER flexibility predicting day-level well-being variables. In order to allow for comparison of day-level effects and person-level effects, effect sizes derived from the multilevel models were transformed to Pearson’s r (Verbeke & Molenberghs, 2000). The equations for the multilevel models are presented below using between adaptive ER variability as an example predictor and total daily negative affect as an example outcome.

$$NA_{it} = \beta_{0i} + \beta_{1i}(\text{Between adaptive ER}_{it}) + \beta_{2i}(\text{Mean endorsement of adaptive ER}_{it}) + e_{it},$$

$$\beta_{0i} = \gamma_0 + \mu_{0i},$$

$$\beta_{1i} = \gamma_1 + \mu_{1i},$$

$$\beta_{2i} = \gamma_2.$$

Only results that were consistent across Samples 1 and 2 were considered robust and therefore noted and discussed.

RESULTS

Participants

No participants dropped out from Sample 1 and one participant (2.5%) dropped out from Sample 2, leaving the final samples at 51 (Sample 1) and 39 (Sample 2). In sample 1, 88.2% of the participants were women, and the mean age was 23.7, ranging from 20 to 27. In Sample 2, 74.4% of participants were women, and the mean age was 25.4, ranging from 21 to 57. There was no statistically significant difference between the two samples regarding age ($p = 0.106$), education ($p = 0.324$), or gender ($p = 0.088$). See also Table 1 regarding habitual well-being and emotion regulation.

Out of a total of 30 prompts in sample 1, 13.5% responses were missing on average for each participant. In Sample 2, participants received a total of 40 prompts, and 28.5% responses were missing on average for each participant. No data at the item level was missing, since only completed observations were included in the analyses.

Items representing different ER strategies

Except for one experiential avoidance item and the two reappraisal items in Sample 2, there was a moderate correlation (i.e., ≥ 0.3) between the daily measures and their trait (person-level) version, indicating that the chosen ER strategies were valid measures of their trait version (see Table 2).

Table 1. Participant descriptive statistics

Measure	Sample 1		Sample 2	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
HADS_total	13.22	3.44	9.42	5.33
SWLS_total	27.06	5.57	26.87	5.58
PSWQ_total	48.29	11.74	47.97	9.62
EQ_total	37.78	6.88	39.21	7.87
FFMQ_total	21.33	5.11	21.95	5.50
ERQ_reappraisal_total	29.51	4.36	30.47	6.50
ERQ_suppression_total	11.35	5.10	11.22	5.11
AAQ_experiential_avoidance_total	26.24	5.90	24.40	6.10
RRQ_rumination_total	40.92	9.66	36.47	10.57
RRQ_reflection_total	44.58	10.02	47.11	8.26

Note: Means (*M*) and Standard Deviations (*SD*) from baseline measures. HADS = Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983), SWLS = Satisfaction With Life scale (Diener *et al.*, 1985), PSWQ = Penn State Worry Questionnaire (Meyer *et al.*, 1990), EQ = Experiences Questionnaire (Fresco *et al.*, 2007), FFMQ = Five Facet Mindfulness Questionnaire (Baer *et al.*, 2008), ERQ = Emotion Regulation Questionnaire (Gross & John, 2003), AAQ = Acceptance and Action Questionnaire (Bond & Bunce, 2003) and RRQ = Rethinking Rumination Questionnaire (Trapnell & Campbell, 1999).

Table 2. Validity of the daily items: Correlation coefficients between two daily items and the baseline score

	Sample 1		Sample 2	
	ER strategy 1	ER strategy 2	ER strategy 1	ER strategy 2
PSWQ worry	0.55	0.59	0.59	0.58
RRQ reflection	0.570	0.50	0.50	0.55
RRQ rumination	0.48	0.46	0.51	0.44
ERQ reappraisal	0.37	0.41	0.19*	0.15*
ERQ suppression	0.48	0.59	0.66	0.69
EQ distancing	0.59	0.46	0.56	0.62
AAQ experiential avoidance	0.40	0.60	0.27*	0.40
FFMQ non-reactivity	0.44	0.46	0.68	0.56

Note: AAQ = Acceptance and Action Questionnaire; EQ = Experiences Questionnaire; ER = emotion regulation; ERQ = Emotion Regulation Questionnaire; FFMQ = Five Facet Mindfulness Questionnaire; PSWQ = Penn State Worry Questionnaire; RRQ = Rethinking Rumination Questionnaire.

*Value below threshold of ≥ 0.3 .

Associations between person-level indicators of variability and flexibility and baseline measures of well-being

Table 3 shows associations between the different ER indicators and how ER variability and ER flexibility were associated with well-being at the person level. Concerning associations between the ER variability indicators, total *between* ER variability was positively correlated with putatively maladaptive *between* ER variability (medium to large effects; $r = 0.82/0.71$), and putatively adaptive *within* ER variability (medium effects; $r = 0.36/0.41$). Total *within* ER variability was found to be positively correlated with putatively adaptive *between* ER variability (medium to large effects; $r = 0.720/0.35$) and maladaptive *between* ER variability (medium to large

effects; $r = 0.40/0.61$). Putatively adaptive *within* ER variability was found to be positively correlated with putatively maladaptive *between* ER variability (medium to large effects; $r = 0.47/0.65$). In addition, all *within* variability indicators were positively correlated with each other (medium to large effects) (see Table 3).

In terms of associations between ER variability and ER flexibility indicators, putatively adaptive ER flexibility was found to be positively correlated with putatively maladaptive *between* ER variability (medium to large effects; $r = 0.60/0.48$), and maladaptive ER flexibility was found to be negatively correlated with all *within* ER variability variables (medium to large effects).

As evident from the results, total *within* ER variability was consistently associated with higher levels of negative affect (medium to large effects in Sample 1/Sample 2; $r = 0.39/0.50$), stress ($r = 0.49/0.42$) and less satisfaction with life ($r = -0.33$). In addition, both putatively adaptive *between* and *within* ER variability were associated with less well-being. Specifically, putatively adaptive *between* ER variability was consistently associated with higher levels of both negative affect (medium to large effects; $r = 0.55/0.34$) and stress ($r = 0.51/0.34$), and less satisfaction with life ($r = -0.54$). Putatively adaptive *within* ER variability was associated with less satisfaction with life ($r = -0.59$). No putatively maladaptive ER variability indicators were reliably associated with measures of well-being. Finally, putatively adaptive, putatively maladaptive, and total ER flexibility were not reliably associated with any measures of well-being at this level (see Table 3).

Associations between day-level ER indicators and daily well-being

Results from day-level analyses are presented in Table 4. Regarding *between* ER variability, total *between* ER variability was a positive predictor of satisfaction with life (medium effect; $r = 0.35$). In addition, putatively adaptive *between* ER variability was a negative predictor of daily satisfaction with life (large effect; $r = -0.67$) and total daily positive affect (medium to large effects; $r = -0.51/-0.33$). In addition, putatively adaptive *between* ER variability was a positive predictor of total daily negative affect (medium to large effects; $r = 0.68/0.39$). Putatively maladaptive *between* ER variability predicted total daily negative affect (medium effects; $r = 0.36/0.35$), but did not consistently predict any other daily well-being measures.

For *within* ER variability, total *within* ER variability was a negative predictor of satisfaction with life ($r = -0.63$). In addition, putatively maladaptive *within* ER variability was negatively associated with daily satisfaction with life (medium effect; $r = -0.30$).

Flexibility indicators (i.e., putatively adaptive, maladaptive, and total ER flexibility) were not consistently associated with any other measures of well-being, except for putatively adaptive ER flexibility which was a negative predictor of satisfaction with life (medium effect; $r = -0.45$) (see Table 4).

DISCUSSION

With the present studies, we wanted both to replicate past findings in the literature concerning indicators of variability in ER and to

Table 3. Associations between person-level indicators and well-being outcomes for study 1 (lower part of the table) and study 2 (upper part of the table)

Sample 1		Sample 2										
	<i>M (SD)</i>	Total ERF	Adaptive ERF	Maladaptive ERF	Total ERV (between)	Adaptive ERV (between)	Maladaptive ERV (between)	Total ERV (within)	Adaptive ERV (within)	Maladaptive ERV (within)	Total PA	Stress
	-	0.45 (0.22)	0.41 (0.18)	0.33 (0.15)	1.27 (0.24)	1.09 (0.32)	0.99 (0.30)	0.88 (0.33)	0.85 (0.30)	0.92 (0.39)	9.66 (1.93)	18.30 (4.03)
Total ERF	0.37 (0.20)	-	0.38*	0.54**	0.22	0.46**	0.17	-0.25	-0.21	-0.53**	<-0.01	-0.19
Adaptive ERF	0.28 (0.18)	0.40**	-	0.30	0.34	0.29	0.48*	-0.08	<0.01	-0.16	0.12	0.12
Maladaptive ERF	0.50 (0.21)	0.54**	0.14	-	0.42*	<0.01	0.15	-0.56**	-0.37	-0.60**	0.22	0.11
Total ERV	1.06 (0.25)	0.55**	0.34*	0.17	-	0.09	0.71**	0.24	0.41*	0.09	-0.25	0.12
(between)												
Adaptive ERV	0.71 (0.26)	0.10	-0.12	-0.05	0.22	-	-0.03	0.35*	0.12	0.40*	0.34*	0.08
(within)												
Maladaptive ERV	0.96 (0.30)	0.49**	0.60**	0.09	0.82**	-0.07	-	0.61**	0.65**	0.52**	0.21	-0.16
(between)												
Total ERV (within)	0.83 (0.25)	-0.17	-0.20	-0.51**	0.28	0.72**	0.40*	-	0.94**	0.97**	0.50**	0.12
Adaptive ERV (within)	0.77 (0.25)	-0.05	-0.22	-0.38**	0.36*	0.65**	0.47**	0.99**	-	0.78**	0.28	0.14
Maladaptive ERV (within)	0.83 (0.25)	-0.21	-0.16	-0.60**	0.19	0.79**	0.33	0.99**	0.88**	-	0.44**	-0.01
(within)												
Total NA	9.16 (1.67)	0.08	<-0.01	-0.09	-0.01	0.55**	0.10	0.39**	0.27	0.10	-	-0.15
Total PA	17.80 (3.54)	0.31*	0.01	0.18	0.46*	-0.10	0.22	-0.11	0.07	0.22	-0.30*	-
Stress	16.76 (5.41)	-0.09	-0.06	-0.29*	-0.14	0.51**	0.10	0.49**	0.37*	0.10	0.57**	-0.34*
Satisfaction with life	7.47 (0.97)	0.04	-0.03	0.12	0.22	-0.54**	-0.01	-0.33*	-0.59**	-0.01	-0.62**	-0.64**

Note: ERF = ER flexibility; ERV = ER variability; ICC = intra-class correlation coefficients; NA = negative affect; PA = positive affect. Mean scores for ERF variables refer to ICCs subtracted from 1; higher scores indicate better emotion differentiation (i.e., flexibility). Results from the Pearson's analyses were based on z-transformed differentiation scores.

**p* < 0.05;
 ***p* < 0.01.

Table 4. Results from multilevel models with day-level mean centered ER indicators predicting day-level well-being

Predictor	Outcome	<i>F</i>	<i>p</i>	<i>r</i>
		Sample 1/Sample 2	Sample 1/Sample 2	Sample 1/Sample 2
Daily total ER flexibility (person mean-centered)	Daily total NA	0.74/1.47	0.394/0.236	0.14/0.24
	Daily total PA	1.47/2.45	0.233/0.129	-0.19/-0.28
	Daily total SWL	2.29/-	0.138/-	-0.23/-
Daily adaptive ER flexibility (person mean-centered)	Daily total NA	4.03/1.59	0.051/0.220	0.29/-0.25
	Daily total PA	5.21/0.02	0.029/0.903	-0.37/-0.03
	Daily total SWL	8.55/-	0.006/-	-0.45/-
Daily maladaptive ER flexibility (person mean-centered)	Daily total NA	4.71/0.07	0.036/0.796	-0.32/-0.04
	Daily total PA	0.02/1.22	0.888/0.278	0.02/-0.19
	Daily total SWL	1.87/-	0.178/-	0.20/-
Daily total ER between variability (person mean-centered) ^a	Daily total NA	0.63/0.74	0.430/0.396	0.11/0.15
	Daily total PA	9.50/3.02	0.004/0.091	0.42/0.28
	Daily total SWL	7.12/-	0.010/-	0.35/-
Daily adaptive ER between variability (person mean-centered) ^a	Daily total NA	35.25/5.04	<0.001/0.032	0.68/0.39
	Daily total PA	16.67/4.43	<0.001/0.042	-0.51/-0.33
	Daily total SWL	34.07/-	<0.001/-	-0.67/-
Daily maladaptive ER between variability (person mean-centered) ^a	Daily total NA	6.92/4.62	0.011/0.039	0.36/0.35
	Daily total PA	<0.01/0.11	0.969/0.740	-0.01/0.05
	Daily total SWL	0.11/-	0.739/-	0.06/-
Daily total ER within variability (person mean-centered) ^a	Daily total NA	31.53/2.18	<0.001/0.152	0.64/0.27
	Daily total PA	6.28/2.31	0.018/0.137	-0.41/-0.25
	Daily total SWL	26.51/-	<0.001/-	-0.63/-
Daily adaptive ER within variability (person mean-centered) ^a	Daily total NA	12.07/0.57	0.001/0.454	0.45/0.13
	Daily total PA	0.29/0.65	0.591/0.424	0.08/0.14
	Daily total SWL	3.71/-	0.061/-	-0.28/-
Daily maladaptive ER within variability (person mean-centered) ^a	Daily total NA	8.89/0.19	0.004/0.682	0.39/0.19
	Daily total PA	1.71/0.87	0.197/0.357	-0.19/-0.16
	Daily total SWL	4.42/-	0.041/-	-0.30/-

Note: ER = emotion regulation; NA = negative affect; PA = positive affect; SWL = satisfaction with life.

^aAnalyses included mean endorsement of strategies as a covariate.

add to the field with an investigation of flexibility in ER, operationalized as the non-convergence or independent use of ER strategies across time points. Specifically, we wanted to evaluate the associations between these indicators and measures of well-being at both the person and day level, where an association may corroborate certain indicators as prerequisites of adaptive ER.

First, based on the results, it can be discussed if ER flexibility and ER variability should be viewed as separate ER indicators. Correlations among the indicators showed that putatively adaptive ER flexibility was positively correlated with putatively maladaptive *between* ER variability of medium to large magnitude, and maladaptive ER flexibility was negatively correlated with all *within* ER variability variables of medium to large magnitude. Based on the size of the correlation coefficients, the two constructs may be argued to be somewhat overlapping, potentially reflecting common ER abilities. Future research needs to assess this possibility further in order to decide if they can or should be viewed as separate constructs.

ER variability

Aligning with Blanke *et al.* (2019), we defined variability in relation to a person's mean and so findings regarding variability were over and above effects of mean levels of strategy used at a given occasion or across time points. However, we did not replicate the negative association between negative affect and *between* total ER variability as presented in Blanke *et al.* (2019).

Thus, our results seem inconsistent with the idea that prioritizing some strategies over others could represent an adaptive search for the best strategy in relation to the context (Blanke *et al.*, 2019; Bonanno & Burton, 2013).

In addition, when considering putatively adaptive and maladaptive strategies separately, the results suggest that putatively adaptive *between* ER variability both at the person and day level was associated with *less* well-being. This finding is in line with findings on positive emotion variability, suggesting that that too much variability might be maladaptive (Gruber, Kogan, Quoidbach & Mauss, 2013). Taken to everyday life, this could mean that stability in both positive emotion variability and putatively adaptive ER are beneficial. One could speculate that using a range of different putatively adaptive strategies (e.g., reappraisal, non-reactivity) may reflect an unsuccessful trial-and-error approach in attempting to regulate emotions. This could potentially indicate that the individual is not confident in and aware of which strategies that are helpful in certain situations. Such speculation is in accordance with findings from a recent study that concludes that individuals who persist with strategies in a given situation seem to show greater psychological health than those who switch strategies more frequently (Southward *et al.*, 2018).

One could also speculate that adaptiveness of variability is uncurvedly shaped: On the one hand, that too little ER variability is problematic and indicates that the individuals' ER is not contextually balanced. On the other hand, that too much ER

variability reflects the unsuccessful trial-and-error approach in attempting to regulate emotions. There may potentially be a “sweet spot” for ER variability, located somewhere between total absence and very high levels of ER variability.

Putatively maladaptive *between* ER variability was only associated with less well-being at the day level, but not the person level. Little consistency at the two levels (i.e., person and day) is congruent with previous findings on emotion complexity, which has led to the suggestion that person-level data should not be used to draw conclusions on what occurs at the day level (Erbas *et al.*, 2018; O’Toole *et al.*, 2020; Scollon, Kim-Prieto & Scollon, 2003; Snijders & Bosker, 1999). Indeed, person-level assessments may capture qualitatively different aspects of ER than day-level assessments (e.g., Brans, Koval, Verduyn, Lim & Kuppens, 2013). Although one could argue that with more than three or four prompts per day, we could have potentially obtained more nuanced daily measures, Brose, Schmiedek, Gerstorf, and Voelkle (2019) argue that if results change drastically based on the number of assessment times, this would severely question the robustness of the results. There was a robust negative association between total *within* ER variability and all well-being measures (except positive affect) of medium to large magnitudes both at the person and the day level. This finding may help clarify Blanke *et al.*’s (2019) mixed results regarding *within* ER variability, which was associated with depressive symptoms, but at the same time predicted lower negative affect. Specifically, putatively adaptive *within* ER variability was associated with less well-being at the person level, not the day level, suggesting that the more variability in the use of individual adaptive strategies (e.g., reappraisal, acceptance) over different time points or contexts, the higher the levels of emotional distress. In addition, putatively maladaptive *within* ER variability was associated with less well-being at the day level, not the person level. High levels of variability may be characterized by extreme fluctuations (Blanke *et al.*, 2019; Houben *et al.*, 2015). Our findings that putatively adaptive *within* ER variability at the person level and putatively maladaptive *within* ER variability at the day level were associated with less well-being may reflect such fluctuation or instability in ER strategy employment (Houben *et al.*, 2015). Accordingly, if an individual uses high levels of a given strategy in certain situations, but not in others, this may reflect radical changes in the ways in which an ER strategy is used.

ER flexibility

In exploring the flexibility indicators’ associations with well-being, we found that putatively adaptive ER flexibility was a *negative* predictor of satisfaction with life at the day level. This finding may simply reflect that it can be beneficial to use the *same* putatively adaptive ER strategies to regulate emotions across *different* occasions. Indeed, if adaptive strategies optimally co-occur in the successful regulation of emotions, this would manifest as low ER flexibility. In certain psychotherapies, clients are actually encouraged to use certain ER strategies in succession. In Emotion Regulation Therapy, for instance, individuals are advised to first use a putatively adaptive attention regulation strategy (e.g., sustained attention) after which a putatively adaptive meta-cognitive strategy can be employed (e.g.,

decentering; Renna, Quintero, Fresco & Mennin, 2017). However, this particular finding concerning putatively adaptive ER flexibility should be seen in light of the remaining non-significant associations between ER flexibility and measures of well-being and thus needs to be replicated and further explored.

Implications

We believe that the evaluation of ER variability and ER flexibility and their association with measures of well-being is an important first step in honing adaptiveness in ER patterns. However, the mixed results may both question the validity of ER variability and ER flexibility and point to important aspects to consider in future studies. Specifically, Aldao *et al.* (2015) suggest that ER variability and flexibility are not necessarily adaptive in and of themselves. For this (and other) indicator(s) to be adaptive, the individual’s ER should facilitate goal obtainment in a contextually appropriate manner. In the present study, we do not know if ER strategies were employed in a manner securing the individual’s desired emotional state or obtainment of personal goals. For instance, if an individual applied a wide range of different ER strategies across time and across contexts, but failed to regulate their emotions as wanted, this would not be an indication of an *adaptive* ER, albeit flexible. Hence, ER variability and flexibility may be viewed as important facilitators or prerequisites of adaptive ER, but ultimately adaptive ER hinges on contextually sensitive ER strategy use. The same explanation may be relevant in understanding why these samples, and the studies conducted by Blanke and colleagues, report differing results regarding *between* ER variability. For *between* ER variability, that is fluctuations in the breadth or width of strategies to be adaptive, this must be evaluated against obtainment of desired emotional state or personal goals (Aldao *et al.*, 2015). For instance, an individual may be able to use several different strategies, but rather than enhancing the obtainment of desired emotional state or personal goals, simply using a wide range of different strategies could easily reflect trial-and-error approach in an (perhaps unsuccessful) attempt to regulate emotions.

Second, future research could benefit from considering other ways of assessing patterns in strategy employment as well as repertoire size. Regarding patterns in strategy employment, one could investigate the co-variation between certain *clusters* of strategies as recently done by McMahon & Naragon-Gainey (2018). The authors derived strategy clusters by factor analysis and found that one factor, that is, overall use of so-called *engagement strategies* (e.g., reflection, acceptance), was associated with less negative and more positive affect, whereas another factor, that is, the overall use of so-called *avoidance strategies* (e.g., expressive suppression, rumination), showed the opposite pattern at the person level. Regarding repertoire size, defined as the number of strategies a person can access (Southward & Cheavens, 2020), initial evidence indicates that a greater repertoire to some extent is positively associated with adaptive outcomes (Cheng, Lau & Chan, 2014; Southward *et al.*, 2018). However, these findings need to be replicated in future research to determine their validity.

Third, one recent study found that individuals who used reappraisal in more flexible ways (i.e., more use in uncontrollable

situations and less use in controllable situations) showed higher levels of well-being (Haines, Gleeson, Kuppens *et al.*, 2016). Thus, rather than looking at ER patterns (i.e., multiple strategies and variability and flexibility within them), research may also evaluate variability and flexibility in single ER strategies.

More research on ER patterns, considered across single or multiple strategies, and their potential role in adaptive emotion regulation is crucial from a normative perspective. When such empirical body grows, it can begin to inform clinical practice, and we can start thinking about how we cultivate certain emotion experiences and adaptive ER skills.

Limitations

The present findings should be seen in light of a number of limitations. First, as this is the first study operationalizing ER flexibility as a potential indicator, more research is needed to explore the validity of this operationalization. Second, future research needs to include participants with larger variation in emotional distress. The present samples were healthy samples. Third, this study only investigated three ER indicators (i.e., *within* and *between* ER variability and ER flexibility) and other indicators could potentially show stronger associations with measures of well-being (e.g., co-variation between certain *clusters* of strategies; McMahon & Naragon-Gainey, 2019). Fourth, small correlations (Sample 2: $r = 0.19/0.15$) were found between the two items measuring daily reappraisal and the total reappraisal at baseline. This was also the case for one daily experiential avoidance item in Sample 2 ($r = 0.27$), questioning the validity of these daily ER strategies as measures of their trait counterpart. However, it should be noted that the daily items for these strategies were reversed, while this was not the case for the trait (i.e., baseline) items. This discrepancy in wording of the items between day level and person level may explain the small correlation (Ebesutani, Drescher, Reise *et al.*, 2012). Fifth, the baseline measure of AAQ (Bond & Bunce, 2003) showed poor internal consistency with a low Cronbach's alpha value (α : Sample 1 = 0.56/Sample 2 = 0.55). The same was true for baseline measure of ERQ (Gross & John, 2003, $\alpha = 0.63$) in Sample 1. However, all other reliability measures of ER baseline questionnaires exceeded 0.7. Sixth, these studies employed a smaller N compared with the studies conducted by Blanke and colleagues. However, we were able to detect associations of a moderate ($r = 0.32$) magnitude as significant, indicative of sufficient power. Seventh, a substantial amount of data was missing, limiting the stability of the results, especially since outcome measures differed as a function of missingness. Eighth, more baseline questionnaires would be needed for a more comprehensive evaluation of psychological distress. However, employing the HADS specifically was a decision made a priori. A final limitation concerns the methodology employed. In spite of the many advantages of experience sampling, such as high ecological validity and the ability to measure ER in real life (i.e., context dependent; Bonanno & Burton, 2013; O'Toole *et al.*, 2014), this method lacks the benefits of laboratory control. Erbas *et al.* (2014) have noted that participants differ in number of difficulties experienced in the period during which they are assessed. Such differences in overall context have been argued to affect the use of ER strategies.

CONCLUSION

The present study denotes an attempt to replicate and extend the findings in the literature concerning variability and flexibility in ER and their association with well-being at the person and day level. Indicators of ER variability and ER flexibility were differently related to each other and measures of well-being. The findings indicate that total *within* ER variability was negatively associated with well-being both when considered at the person level and day level. In addition, both putatively adaptive *between* and *within* ER variability were associated with less well-being at the person level. At the day level, both putatively maladaptive and adaptive *between* ER variability as well as maladaptive *within* ER variability were negatively associated with well-being. Indicators of ER flexibility were not consistently associated with well-being at the person level. At the day level, putatively adaptive ER flexibility was negatively associated with satisfaction with life. We thus add to the existing body of literature by suggesting that the *within* ER variability indicator may be a prerequisite for maladaptive emotion regulation. We propose that future research on the adaptiveness of indicators of variability and flexibility of ER obtain more contextual information and consider other indicators.

ENDNOTES

¹ There is a sample overlap with another study (O'Toole *et al.*, 2021) where the main purpose was to investigate the relationship between emotion differentiation and emotion regulation choice. There are no overlaps in research questions or main analyses between that and the present study.

² At the person level, 3% (1 person) from Sample 2 was excluded from analyses with the adaptive ER flexibility indicator and 5% (2 persons) from Sample 2 were excluded from analyses with the maladaptive ER flexibility indicator. At the day level, negative ER flexibility was missing for 35.1% (179 days) in Sample 1 and 43.8% (171 days) in Sample 2, adaptive ER flexibility was missing for 38.4% (196 days) in Sample 1 and 36.4% (142 days) in Sample 2 and maladaptive ER flexibility was missing for 30.6% (156 days) in Sample 1 and 37.4% (146 days) in Sample 2. A relatively large number of missing cases is normal in research on emotion differentiation (e.g., Erbas *et al.*, 2019). In order to investigate the robustness of the results, we compared well-being outcomes for days for which ICCs were available with days for which they were missing using multilevel models. The results revealed that across flexibility measures, total daily negative affect, total daily positive affect and well-being were significantly higher on days for which ICC's were missing.

DATA AVAILABILITY STATEMENT

Data availability statement: The data that support the findings are available on following link (this will be available upon acceptance)

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