AMERICAN PSYCHOLOGICAL ASSOCIATION

Emotion

ISSN: 1528-3542

2024, Vol. 24, No. 5, 1299–1311
https://doi.org/10.1037/emo0001351

Stuck With the Foot on the Pedal: Depression and Motivated Emotion Regulation in Daily Life

Danfei Hu[1], Shir Mizrahi Lakan[1], Elise K. Kalokerinos[2], and Maya Tamir[1]
[1] Psychology Department, The Hebrew University of Jerusalem
[2] Melbourne School of Psychological Sciences, University of Melbourne

According to cybernetic approaches, emotion regulation is motivated by the desire to reduce discrepancies between experienced and desired emotions. Yet, this assumption has rarely been tested directly in healthy or unhealthy populations. In two ecological momentary assessment studies, we monitored motivated emotion regulation in daily life in participants who varied in the severity of their depressive symptoms (Study 1; $N = 173$) and in clinically depressed and nondepressed participants (Study 2; $N = 120$). Across studies, associations between motivation in emotion regulation and discrepancies between experienced and desired emotions differed by depression. As expected, as discrepancies between experienced and desired emotions increased, individuals with lower depressive symptoms or without a clinical depression diagnosis were more motivated to regulate their emotions. In contrast, we found no evidence (Study 1) or weaker evidence (Study 2) for sensitivity to the size of the discrepancies between experienced and desired emotions among individuals with higher depressive symptoms or those diagnosed with clinical depression. These individuals were consistently motivated to regulate their emotions, regardless of the size of the discrepancies. These findings suggest that individuals prone to or suffering from depression may be less sensitive than nondepressed individuals to regulatory demands in emotion regulation.

Keywords: emotion regulation, motivation, desired emotions, goals, depression

Supplemental materials: https://doi.org/10.1037/emo0001351.supp

Healthy goal pursuit is sensitive to regulatory needs, such that the intensity of motivation (e.g., how much effort one invests) in goal pursuit increases with the size of the discrepancy between current states and desired states (e.g., Carver & Scheier, 1981). For instance, when you are driving and are far from your destination, you need to hit the gas pedal to make sufficient progress forward. But as you get close to your desired location, you can take your foot off the pedal, as the need to move forward decreases. This process may apply to emotion regulation. When you try to reach an emotional destination that is far from your experienced emotion (e.g., you want to feel no sadness when you are very sad), you may be highly motivated to regulate your emotion (e.g., you invest considerable effort to change). However, as your experienced emotion moves closer to your desired emotion (i.e., you want to feel no sadness when you feel only a bit sad), your motivation to change how you feel may decline (e.g., you invest less effort to regulate). In this investigation, we tested whether discrepancies between experienced and desired emotions are linked to motivation in emotion regulation.

Effortful regulation should be tailored to the size of the discrepancies between experienced and desired emotions. Such a match, however, may characterize healthy emotion regulation, but may be less characteristic of unhealthy emotion regulation. Indeed, if regulatory effort is insensitive to regulatory needs, it could lead to dysfunctional emotion regulation, as characteristic of depression (e.g., Sheppes et al., 2015). Research on emotion regulation deficits in depression has focused separately on what people do to regulate (e.g., Millgram et al., 2023) or the goals they pursue (e.g., Millgram et al., 2015, 2019), but little attention has been devoted to the association between effort in emotion regulation

This article was published Online First February 26, 2024.
Danfei Hu https://orcid.org/0000-0001-6228-692X
The authors would like to acknowledge support to Maya Tamir, Artery Chair in Personality Studies Endowed by Goldberg, Geller, and Luria. Danfei Hu thanks the Lady Davis Fellowship Trust at the Hebrew University of Jerusalem for the award of a Postdoctoral Fellowship and the Azrieli Foundation for the award of an Azrieli International Postdoctoral Fellowship. The authors have no competing interests to disclose. In both studies, the authors analyzed data that were collected as part of larger projects. The current hypotheses were not preregistered.

Data, materials, and codes are available at https://osf.io/35bzh/?view_only=1ec12f677b0c43d895cd41596b5f9c09.

Danfei Hu served as lead for conceptualization, data curation, formal analysis, investigation, methodology, software, validation, visualization, writing–original draft, and writing–review and editing. Shir Mizrahi Lakan served in a supporting role for data curation, investigation, and software. Elise K. Kalokerinos contributed equally to investigation and methodology and served in a supporting role for data curation, supervision, validation, and writing–review and editing. Maya Tamir served as lead for conceptualization, data curation, funding acquisition, investigation, methodology, project administration, resources, supervision, validation, and writing–review and editing, contributed equally to writing–original draft, and served in a supporting role for formal analysis and visualization. Shir Mizrahi Lakan and Elise K. Kalokerinos contributed equally to project administration and resources.

Correspondence concerning this article should be addressed to Danfei Hu, Department of Psychology, The Hebrew University of Jerusalem, Mount Scopus, Jerusalem 9190501, Israel. Email: danfei.hu@mail.huji.ac.il

and the goals people pursue. To this end, we tested whether depressed and nondepressed individuals differ in the extent to which they match regulatory efforts to emotion goal discrepancies.

Emotion Regulation as a Cybernetic Process

Emotion regulation is the process by which individuals influence what emotions they experience, and when and how they experience them (e.g., Gross, 1998). According to the extended process model (Gross, 2015), emotion regulation involves three consecutive stages: identification, selection, and implementation. Identification involves the activation of a goal to modulate emotions. Selection involves picking a strategy to regulate emotions. Implementation involves using that strategy to yield desired emotional changes. Most research on emotion regulation has focused on the selection and implementation stages. Less attention has been devoted to the identification stage. Therefore, we know little about what motivates individuals to engage in emotion regulation and what influences how much effort they invest in doing so.

According to cybernetic approaches to emotion regulation (Tamir, 2021; Webb et al., 2012), a comparator function compares experienced emotions with desired emotions (i.e., emotion goals). The size of the discrepancy between experienced and desired emotions should signal the need to regulate and its urgency. Larger discrepancies indicate a greater need to change and should theoretically increase the motivation to engage in emotion regulation in order to reduce those discrepancies. Smaller discrepancies indicate a weaker need to regulate, thereby decreasing the motivation to engage in emotion regulation. Higher motivation to regulate could be reflected in a greater desire to regulate and in investing greater effort in regulation (Gollwitzer, 1990; Wright, 2008).

To date, few empirical studies have examined motivation in emotion regulation. For example, consistent with cybernetic predictions, directing people to focus on discrepancies between experienced and desired emotions and form plans of regulatory action to minimize those discrepancies (e.g., which strategies to use) facilitated success in emotion regulation (Webb et al., 2012). However, whether and how discrepancies between experienced and desired emotions are linked to motivation in emotion regulation has not yet been tested. Examining this question is important because motivation may influence success in emotion regulation. Evidence suggests that the more motivated people are to change their emotions, the more they try, and the more effort they invest in doing so, subsequently the more successful they will be in changing their emotions (Gutentag & Tamir, 2022).

Like other forms of self-regulation, effective emotion regulation depends on the mobilization of resources, such as effort, energy, and strategies (e.g., Koole et al., 2012). In healthy emotion regulation, discrepancies between experienced and desired emotions should calibrate motivation (e.g., desire to regulate or effort invested in doing so). Motivation should be higher when discrepancies are large, but relatively lower when discrepancies are small. If this calibration goes awry, it may impair available resources, and lead to less adaptive emotion regulation, as is characteristic in depression. Therefore, we hypothesize that whereas in healthy emotion regulation (e.g., among people without major clinical disorders), motivation varies as a function of the size of the discrepancies between experienced and desired emotions, this might not be the case in unhealthy emotion regulation (e.g., among those with emotion regulation deficits).

Motivated Emotion Regulation in Depression

Depression is characterized by unhealthy emotion regulation, increased levels of unpleasant emotions, and decreased levels of pleasant emotions (e.g., Vanderlind et al., 2020). Thus far, research has examined the differences between depressed and nondepressed individuals in how much unpleasant (e.g., sadness) or pleasant (happiness) emotions they want to experience (e.g., Millgram et al., 2015, 2019). Yet, few studies have investigated how motivated people are to regulate emotions (e.g., to decrease sadness) in daily life.

When asked about desired emotions, both depressed and nondepressed people report wanting to feel happiness at relatively high intensity and sadness at relatively low intensity. Nondepressed individuals tend to experience relatively high levels of happiness and desire relatively high levels of happiness. In contrast, depressed individuals tend to experience relatively low levels of happiness and desire moderately high levels of happiness—lower than the desired level of happiness among nondepressed individuals. For example, Millgram et al. (2019) measured experienced and desired happiness among depressed and nondepressed students several times over the course of a semester. On a scale ranging from 1 (*not at all*) to 7 (*extremely*), average experienced happiness among nondepressed students was 4.51, and average desired happiness was 6.31. In contrast, average experienced happiness among depressed students was 3.05, whereas average desired happiness was 5.65. A similar pattern of results, but in the opposite direction, was observed with experienced and desired levels of sadness (for experienced sadness: $M_{\text{depressed}} = 3.19$, $M_{\text{nondepressed}} = 1.65$; for desired sadness: $M_{\text{depressed}} = 1.72$, $M_{\text{nondepressed}} = 1.29$).

Hence, depressed individuals want to feel less happiness and more sadness than nondepressed individuals do, but that does not necessarily mean that depressed people are less motivated to increase their happiness or decrease their sadness. In fact, in Millgram et al. (2019), the discrepancies between experienced and desired emotions were larger among depressed than nondepressed individuals (for happiness: 2.60 vs. 1.80; for sadness: 1.47 vs. 0.36). If motivation to regulate emotions depends on the discrepancies between experienced and desired emotions, depressed individuals may be more motivated to increase happiness (or decrease sadness), compared to nondepressed individuals. To our knowledge, no research has yet tested whether motivated emotion regulation in depression is linked to discrepancies between experienced and desired emotions.

Healthy emotion regulation should be characterized by flexibly matching motivated effort to regulatory demands (e.g., Chen & Bonanno, 2021). However, people who suffer from depression often engage in unhealthy emotion regulation (Joormann & Stanton, 2016). Such individuals may be less capable of matching emotion regulation to regulatory demands. For example, depressed (vs. nondepressed) people are less likely to choose emotion regulation strategies that are likely to yield desired emotional outcomes (Millgram et al., 2019). Additionally, compared to nondepressed individuals, depressed individuals might be more likely to overestimate the size of discrepancies between their experienced and desired emotions (e.g., due to insensitivity to contextual cues; Bonanno et al., 2020), or overestimate the amount of energy needed to change their emotions (Gruber et al., 2012). Therefore, we hypothesized that motivation to regulate emotions in depression might be less sensitive to regulatory needs, including the size of the discrepancies between experienced and desired emotions. We predicted that among nondepressed individuals, motivation in emotion regulation would increase as the

discrepancies between experienced and desired emotions increase. However, among depressed individuals, we expected this association between discrepancies and motivation in emotion regulation to be attenuated.

The Current Research

We tested whether larger discrepancies between experienced and desired emotions are linked to higher motivation in emotion regulation among nondepressed individuals, but less so among depressed individuals. We tested this hypothesis in two studies using ecological momentary assessment (EMA). We operationalized motivation by assessing both the degree of effort people invested in regulating emotions (i.e., motivational intensity; Richter, 2013; Wright, 2008; measured in both studies) and how much people desire to regulate emotions (i.e., motivational strength, which contributes to motivational intensity; Richter, 2013; measured in Study 2 only). In Study 1, participants reported their depressive symptoms at baseline and then completed an EMA portion, in which they reported their experienced emotions, desired emotions, and motivational intensity in emotion regulation. In Study 2, participants were diagnosed with clinical depression (or not) before completing an EMA study. To assess if the implications of discrepancies for motivation in emotion regulation vary by valence, we separately assessed discrepancies pertaining to the regulation of pleasant and unpleasant emotions.

Transparency and Openness

Studies 1 and 2 were both conducted as parts of larger projects. All study materials, data, and R codes are available at the Open Science Framework: https://osf.io/35bzh/?view_only=1ec12f677b0c43d895cd41596b5f9c09. We describe how we determined our sample sizes, exclusion criteria, and all measures and analyses relevant to the research questions. The current research questions were not preregistered. The ethics committee of the University of Melbourne approved Study 1 and the ethics committee of the Hebrew University of Jerusalem approved Study 2.

Study 1

Study 1 involved a sample that varied in depressive symptoms. In a seven-day EMA study, participants reported their experienced emotions, desired emotions, and motivation in emotion regulation eight times a day. This EMA design allowed us to assess motivated emotion regulation in daily life. The high frequency of sampling meant that we were able to measure our key constructs near their time of occurrence. We targeted a range of unpleasant and pleasant discrete emotions in order to capture the variability of emotional experiences in daily life. We hypothesized that among individuals with lower depressive symptoms, motivation in emotion regulation would be sensitive to the size of the discrepancies between experienced and desired emotions, such that as discrepancies increase, motivation in emotion regulation should become higher. However, we hypothesized that among individuals with higher depressive symptoms, motivation in emotion regulation would be less sensitive (or even insensitive) to the size of the discrepancies between experienced and desired emotions, such that motivation would be relatively high regardless of whether discrepancies are large or small.

Method

Participants

The sample included 173 participants ($M_{age} = 28.84$, $SD_{age} = 1.24$; 132 women, 38 men, and three other gender identities), who identified as White or Caucasian (50%), East Asian (17%), and South Asian (16%), with 17% identifying as belonging to other ethnic groups. Participants were recruited from multiple sources, including online advertisement (e.g., Facebook, $n = 107$), the participant pool at the University of Melbourne ($n = 38$), and the Research Experience Program at the University of Melbourne ($n = 28$). Based on prior data (Dejonckheere et al., 2019), using the summary-statistics-based power analysis for multilevel models (Murayama et al., 2022), we estimated a minimum sample size of 152 participants ($t = 2.7$, $N = 104$, 90% power with an α of .05) for the larger project.

Procedure

Data in Study 1 were drawn from a larger project investigating everyday emotion regulation. Below, we focused on the study procedure and measures that are relevant to the present research question. Participants completed a baseline survey, where they reported their demographic information and rated their depressive symptoms. Next, participants who owned a smartphone to download the EMA app (SEMA3; Koval et al., 2019) and resided in Australia were invited to participate in the EMA portion of the study. For seven consecutive days, participants received eight EMA surveys via the SEMA3 app every day at random times between 10:00 a.m. and 8:00 p.m., with a minimum of 30 min between each survey. In each EMA survey, participants reported their experienced emotions, desired emotions, and motivation to regulate emotions. Following the recommendations of Geeraerts (2020), we excluded responses submitted in less than 650 ms (0.02% of all responses) and EMA surveys with more than half of the items submitted in less than 650 ms (0.02% of all surveys). The final sample included a total number of 9,580 EMA surveys. Compliance was good overall ($M = 73.14\%$, $SD = 23.50\%$). Participants received up to $45 AUD or three course credits for their participation (see the online supplemental materials for payment incentive details).

Measures

Depressive Symptoms. We used the Center of Epidemiological Studies Depression (CESD) Scale (Radloff, 1977) to measure participants' depressive symptoms at baseline. Participants rated the frequency (0 = *rarely or none of the time*, 3 = *most or all of the time*) with which they had experienced 20 depressive symptoms during the previous week. We summed across items to assess overall depressive symptoms for each participant ($\alpha = .90$).

Experienced Emotions. In each EMA survey, participants rated how much (0 = *not at all*, 100 = *very much*) they felt various unpleasant (i.e., anxious, stressed, sad, and angry) and pleasant (i.e., happy, calm, and hopeful) emotions (e.g., "Right now, how happy do you feel?"). Items were presented in a random order. We computed separate composite scores for experienced unpleasant ($\omega_{between} = .92$, $\omega_{within} = .76$) and pleasant ($\omega_{between} = .96$, $\omega_{within} = .74$) emotions.

Desired Emotions. To measure desired emotions, in each EMA survey, participants rated how much (0 = *not at all*, 100 = *very much*) they wanted to experience each of the seven emotions mentioned

above (e.g., "Right now, how happy do you want to feel?"). We calculated separate composited scores for desired unpleasant ($\omega_{between} = .96$, $\omega_{within} = .65$) and pleasant ($\omega_{between} = .95$, $\omega_{within} = .59$) emotions.

Motivation in Emotion Regulation. Participants responded to the following item, "Since the last survey, how much effort did you put into influencing your emotions?" (0 = *no effort at all*, 100 = *a lot of effort*).

Analyses

Estimating the Discrepancies Between Experienced and Desired Emotions

We computed separate discrepancy scores for each emotion by subtracting experienced emotions from desired emotions. Then we averaged across all four discrepancy scores of unpleasant emotions ($\omega_{within} = .70$, $\omega_{between} = .94$). For unpleasant emotions, a raw discrepancy composite score smaller than zero means that a person felt more unpleasant than they wanted to. We also created a measure of pleasant emotion discrepancies by averaging across the three discrepancy scores of pleasant emotions ($\omega_{within} = .63$, $\omega_{between} = .95$). For pleasant emotions, a raw discrepancy composite score bigger than zero means that a person felt less pleasant than they wanted to. We assessed the distribution of discrepancy scores (see Figure S1 in the online supplemental materials). Most of the time, in daily life, participants reported feeling more unpleasant than desired (discrepancy scores < 0 about 80% of the time), and less pleasant than desired (discrepancy scores > 0 about 88% of the time). In only 9% of the time did participants report wanting to feel more unpleasant emotions than they experienced, and similarly, in only 9% of the time did participants report wanting to feel less pleasant emotions than they experienced. Contrahedonic emotion regulation, therefore, was rare. Next, to ease interpretation, we calculated the absolute values of discrepancy scores, so that for both unpleasant and pleasant discrepancy scores, higher numbers reflect greater discrepancies between experienced and desired emotions.[1]

Multilevel Models

Using an EMA design, in Study 1, we collected repeated and concurrent measures of discrepancies and motivation in emotion regulation over time in daily life. One limitation of this data is that discrepancies and motivation were assessed with reference to different time frames (right now vs. since the last assessment). Nonetheless, the data provided us with the opportunity to initially explore whether associations between discrepancies and motivation in emotion regulation differed as a function of depressive symptoms. We conducted multilevel models to account for the nested data structure inherent in EMA designs. First, we entered discrepancy scores at Level 1 (i.e., the moment level), depressive symptoms at Level 2 (i.e., the person level), and their cross-level interaction as predictors, and motivation at Level 1 as the outcome. Second, to test whether potential observed patterns were attributed to discrepancies, rather than to each of the contributing components (i.e., experienced emotions and desired emotions), we repeated the analysis above, controlling for experienced emotions and desired emotions. Third, to test whether the interaction between discrepancies and depressive symptoms predicted motivation measured within the same specific time window, we controlled for motivation at the previous assessment (i.e., within-day lags). Fourth, given that the sample was relatively diverse where participants were recruited from multiple sources, we controlled for participants' gender and age to ensure that any observed patterns are not attributed to these demographic factors. This is because gender and age have been linked to depression (e.g., Girgus & Yang, 2015; van't Veer-Tazelaar et al., 2008), and so potential differences in motivation may be driven by these characteristics (e.g., men/younger people may be more sensitive to discrepancies than women/older people). The results reported below persisted when controlling for all the above covariates. All Level 1 variables were person-mean-centered, and Level 2 variables were grand-mean-centered.

Multilevel models were conducted in the R statistical programming software (R Core Team, 2013), using the lme4 (Bates et al., 2015) and lmerTest (Kuznetsova et al., 2017) packages. We calculated semipartial adjusted R^2 as the effect sizes for fixed effects using the r2beta function from the package r2*g*lmm (Jaeger et al., 2017). We only included random slopes for discrepancy scores, as the model did not converge otherwise.[2] Missing data were accounted for by using full information restricted maximum likelihood estimation (e.g., Raudenbush & Bryk, 2002). Significant interactions between discrepancies and depressive symptoms were further probed by means of simple slope analyses, using the reghelper package in R (Hughes, 2017). We applied this analysis to examine the regulation of unpleasant and pleasant emotions separately to test if any observed pattern was valence-specific.[3]

Finally, as another way of testing our hypotheses, we conducted multilevel response surface analyses (Nestler et al., 2019) to examine whether the degree of incongruence (i.e., discrepancy) between experienced and desired emotions was linked to motivation in emotion regulation within each subgroup (individuals with higher vs. lower depressive symptoms). This approach overcomes the limitations of using difference scores to assess the implications of the incongruence between two variables (Nestler et al., 2019). For example, difference scores do not retain information about the original values of the variables (X and Y), and when X and Y are positively correlated, difference scores are often less reliable than X or Y. Results were largely consistent with the ones reported below (see the online supplemental materials), further corroborating our findings.

Results

Table 1 presents the descriptive statistics and correlations. Table 2 presents the results of multilevel analyses for unpleasant and pleasant discrepancy scores.

The cross-level interaction between discrepancies and depressive symptoms on motivation was significant for unpleasant emotions,

[1] Because our conceptual focus was on discrepancies, we used these discrepancy scores in our main analyses. However, to corroborate our findings, we also tested our predictions using a different analytic approach (i.e., response surface analyses), as described in further detail below.

[2] For example, when we included random slopes for experienced unpleasant emotions, the model did not converge. To keep the analyses consistent for both unpleasant and pleasant emotions, we only kept random slopes for discrepancy scores. However, the models with additional nonconverging random slopes yielded a similar pattern of results.

[3] We also repeated the analyses by examining each discrete emotion separately. In both studies, results on discrete emotions demonstrated patterns that were mostly consistent with the composite scores, with some differences in Study 1. See the online supplemental materials for these results and a detailed discussion of them.

Table 1
Descriptive Statistics and Zero-Order Correlations Between Variables for Unpleasant and Pleasant Emotions (Study 1)

Variables	ICC	*M*	$SD_{between}$	SD_{within}	1	2	3	4	5
Unpleasant emotions (UE)									
1. CESD	—	39.12	10.17	—	—				
2. UE discrepancies	.49	17.90	12.53	11.71	.46***	—	−.08***	.86***	.03**
3. Desired UE	.67	7.15	1.47	5.33	.11	−.08	—	.24	.07***
4. Experienced UE	.55	23.59	14.90	12.32	.47***	.81***	.49***	—	.06***
5. Mot. in ER	.49	29.66	21.00	18.76	.11	.12	.32***	.30***	—
Pleasant emotions (PE)									
1. CESD	—	39.12	10.17	—	—				
2. PE discrepancies	.52	24.94	14.96	13.15	.49***	—	.24***	−.75***	−.02
3. Desired PE	.68	80.16	15.83	9.05	−.09	.25**	—	.22	.03**
4. Experienced PE	.62	57.32	18.37	13.23	−.48***	−.65***	.55***	—	.05***
5. Mot. in ER	.49	29.66	21.00	18.76	.11	−.07	.06	.13	—

Note. Correlations below the diagonal are between-person correlations. Correlations above the diagonal are within-person correlations. ICC = intraclass correlation, which reflects the proportion of variance at the between-person level; CESD = depressive symptoms; UE = unpleasant emotions; PE = pleasant emotions; Mot. in ER = motivation in emotion regulation.
** $p < .01$. *** $p < .001$.

$B = -0.01$, $SE = 0.003$, $p = .008$, 95% confidence interval (CI) [−0.02, −0.002], $R^2 = .004$, but did not reach statistical significance for pleasant emotions, $B = -0.006$, $SE = 0.003$, $p = .058$, 95% CI [−0.01, −0.003], $R^2 = .002$. To further examine the differences between individuals with lower (vs. higher) depressive symptoms, we conducted simple slope tests to unpack interactions by examining the association between discrepancies and motivation for individuals with lower depressive symptoms (−1 *SD* below mean CESD score) and higher depressive symptoms (+1 *SD* above mean CESD score). Figure 1 displays the interaction plots and results of simple slope tests.[4] As shown in Figure 1A, among people with lower depressive symptoms, larger discrepancies between experienced and desired unpleasant emotions were associated with a stronger motivation to regulate emotions, $B = 0.20$, $SE = 0.08$, $p = .010$, 95% CI [0.05, 0.35]. However, among people with higher depressive symptoms, there was no association between discrepancies and motivation in emotion regulation, $B = 0.02$, $SE = 0.07$, $p = .813$, 95% CI [−0.12, 0.16]. We observed the same pattern with pleasant emotions (see Figure 1B). Among people with lower depressive symptoms, motivation in emotion regulation increased as the discrepancies between experienced and desired pleasant emotions increased, $B = 0.11$, $SE = 0.06$, $p = .048$, 95% CI [0.001, 0.22]. In contrast, among people with higher depressive symptoms, there was no such association, $B = -0.001$, $SE = 0.05$, $p = .993$, 95% CI [−0.11, 0.11].

There were no significant main effects. The main effect of discrepancies was not significant for unpleasant emotions, $B = 0.11$, $SE = 0.07$, $p = .112$, 95% CI [−0.02, 0.24], $R^2 = .001$, or for pleasant emotions, $B = 0.05$, $SE = 0.05$, $p = .254$, 95% CI [−0.04, 0.15], $R^2 = .000$. Also, the main effect of depressive symptoms was not significant for unpleasant emotions, $B = 0.22$, $SE = 0.16$, $p = .161$, 95% CI [−0.09, 0.52], $R^2 = .012$, or for pleasant emotions, $B = 0.22$, $SE = 0.16$, $p = .150$, 95% CI [−0.08, 0.53], $R^2 = .012$.

Discussion

We draw two conclusions from the results of Study 1. First, there was a link between motivation in emotion regulation and the size of the discrepancies between experienced and desired emotions, when assessed as people experience and regulate emotions spontaneously in their daily lives. Second, these associations critically differed by depressive symptoms. Consistent with motivational theories (e.g., Carver & Scheier, 1981), the more their emotional experiences differed from their desired experiences, the more individuals with lower depressive symptoms were motivated to regulate their emotions. However, individuals with higher depressive symptoms were motivated to regulate their emotions, regardless of how much their emotional experiences differed from how they wanted to feel at that time. These findings indicate that people with higher depressive symptoms might be motivated to change how they feel, regardless of how different such feelings are from those they desire.

By sampling eight assessments each day, we were able to track changes in emotional experiences and regulation almost as they occurred. We also sampled a variety of discrete emotions and our results were similar between pleasant and unpleasant emotions. Nonetheless, the strength of the correlations between discrepancies and experienced emotions in Study 1 ranged from moderate to high, particularly for unpleasant emotions. These correlations point to the possibility that differences in motivation in emotion regulation between individuals with high versus low depressive symptoms might be driven by experienced emotions. To examine this possibility directly, we conducted additional analyses to test whether experienced emotions per se were associated with motivation in emotion regulation and whether these associations differed by depressive symptoms/status in both studies. These results are reported in the online supplemental materials. Overall, the patterns of results with experienced emotions differed from the results with discrepancies and did not provide support for our hypothesis, suggesting that although discrepancies and experienced emotions are moderately to highly correlated, our effects were specific to discrepancies.

[4] Research suggests that the traditional simple slope approach to examine interactions with a continuous moderator has limitations because it relies on researchers picking values of the moderator (see McCabe et al., 2018 for a detailed discussion) and therefore may lead to an inappropriate interpretation of the interaction. To address these limitations, the interActive data visualization tool has been recommended for probing interaction effects (McCabe et al., 2018). Figures generated by this application yielded a similar interpretation of the interactions. We discuss this approach and its results in the online supplemental materials.

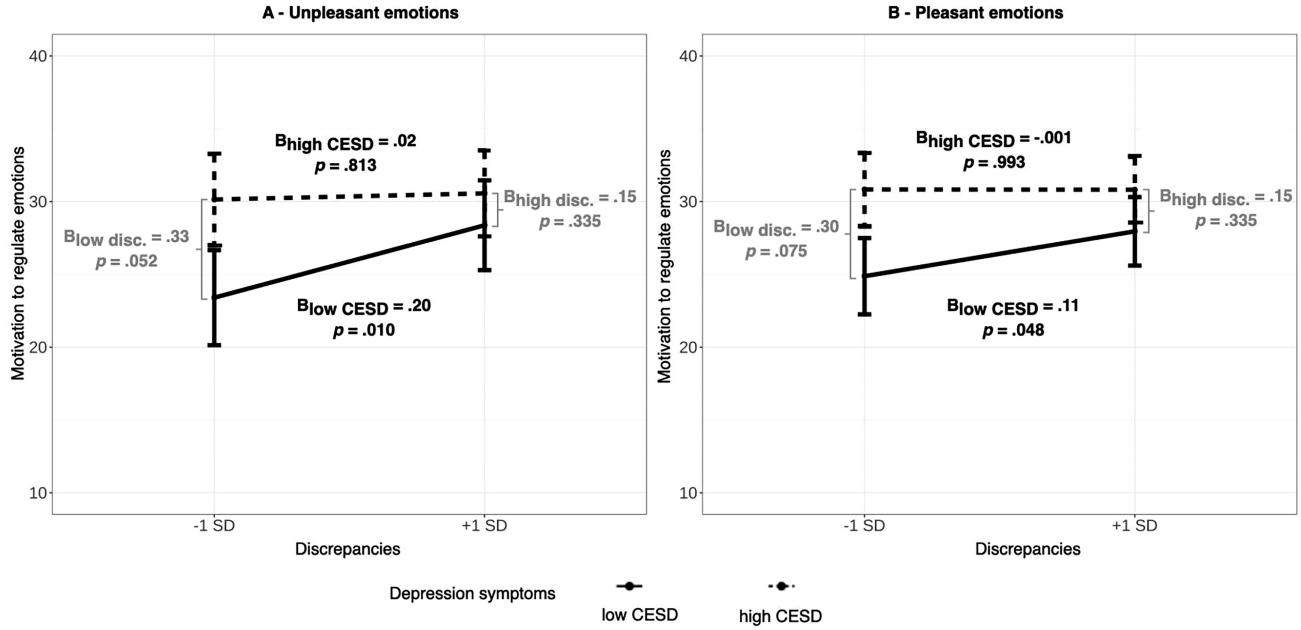
Table 2
Results of Multilevel Analyses (Study 1)

Variables	Unpleasant emotions				Pleasant emotions			
	Estimate (*SE*)	*p*-value	95% CI	R^2	Estimate (*SE*)	*p*-value	95% CI	R^2
Fixed effects								
Level 1 (within-level)								
Intercept	27.79 (1.80)	<.001	[24.27, 31.31]	—	27.56 (1.79)	<.001	[24.05, 31.06]	
Discrepancies	0.11 (0.07)	.112	[−0.02, 0.24]	.001	0.05 (0.05)	.254	[−0.04, 0.15]	.000
Experienced emotion	−0.01 (0.06)	.922	[−0.12, 0.11]	.000	0.07 (0.04)	.094	[−0.01, 0.15]	.001
Desired emotion	0.19 (0.06)	.001	[0.07, 0.31]	.002	0.06 (0.04)	.146	[−0.02, 0.13]	.000
DV_{t-1}	0.20 (0.01)	<.001	[0.17, 0.22]	.038	0.20 (0.01)	<.001	[0.17, 0.23]	.040
Level 2 (between-level)								
CESD[a]	0.22 (0.16)	.161	[−0.09, 0.52]	.012	0.22 (0.16)	.150	[−0.08, 0.53]	.012
Gender[b]	1.21 (3.61)	.738	[−5.86, 8.28]	.001	1.61 (3.58)	.653	[−5.41, 8.63]	.001
Age	−0.26 (0.15)	.093	[−0.55, 0.04]	.017	−0.23 (0.15)	.123	[−0.53, 0.06]	.014
Cross-level interaction								
Discrepancies × CESD	−0.01 (0.003)	.008	[−0.02, −0.002]	.004	−0.006 (0.003)	.058	[−0.01, 0.003]	.002
Random effects								
Intercept	390.67 (19.77)				386.09 (19.65)			
Discrepancies	0.08 (0.29)				0.06 (0.25)			
Residual	375.12 (19.37)				377.41 (19.43)			

Note. *p*-value smaller than .05 is statistically significant. DV = motivation in emotion regulation.
[a] CESD = depressive symptoms. [b] Gender was coded 0 = female, 1 = nonfemale.

One explanation for the high correlation between experienced unpleasant emotions and discrepancy scores in unpleasant emotions is that Study 1 targeted a healthy sample. Despite some variation in participants' depressive symptoms, the desired levels of unpleasant emotions were relatively similar among these individuals. As a result, the correlations between discrepancies and experienced emotions were quite high. This highlights the importance of examining our hypothesis in a more diverse sample, which also includes depressed

Figure 1
Motivation in Emotion Regulation as a Function of Depressive Symptoms and Discrepancies Between Experienced and Desired Emotions, for Unpleasant (A) and Pleasant (B) Emotions (Study 1)



Note. Numbers in black represent results from simple slope analyses, and numbers in grey display results from the simple effect tests. For part label B, simple slopes are plotted even though the interaction was not statistically significant and therefore should be interpreted with caution. For CESD: −1 $SD = -10.57$, +1 $SD = 9.78$. For discrepancies in unpleasant emotions: −1 $SD = -12.31$, +1 $SD = 12.31$. For discrepancies in pleasant emotions: −1 $SD = -13.95$, +1 $SD = 14.03$. Disc. = discrepancies between experienced and desired emotions; CESD = depressive symptoms, grand-mean-centered (ranging from −17.05 to 31.95).

individuals, who might be motivated to experience higher levels of unpleasant emotions and lower levels of pleasant emotions than nondepressed individuals (e.g., Millgram et al., 2015, 2019). In Study 2, we sought to address this and other limitations of Study 1, as described in detail below.

Study 2

Study 2 was a 10-day EMA study that addressed some of the key limitations of Study 1. First, in Study 1, we used a single item to assess how much effort people invested to influence their emotions. To increase the reliability and scope of our measure, in Study 2, we assessed both participants' desire to regulate emotions (i.e., motivational strength) and the effort invested in doing so (motivational intensity). Together, these items should reflect how motivated people were to regulate their emotions (as indicated by perceived desirability and exerted effort). Relatedly, the motivation measure in Study 1 did not allow us to differentiate between attempts to increase pleasant emotions and attempts to decrease unpleasant emotions and to test whether they specifically map onto their respective discrepancies. Thus, in Study 2, we separately assessed the motivation to increase pleasant emotions and the motivation to decrease unpleasant emotions. Given that in Study 1, we found that the frequency of contrahedonic emotion regulation in daily life was low (see also Kalokerinos et al., 2017), we focused exclusively on prohedonic emotion regulation in Study 2.

Second, although all key variables were measured concurrently in Study 1, they did not all target concurrent experiences. Participants rated concurrent experienced and desired emotions, but effort was assessed in reference to the time since the last EMA survey. To address this limitation, Study 2 measured experienced emotions, current emotions, and motivation with respect to the same timeframe (i.e., in the past 2 hr).

Third, Study 1 assessed depressive symptoms in a healthy population. Whether or not the observed effects extend to clinical depression remains to be tested. In Study 2, therefore, we recruited both nondepressed and clinically depressed participants. Having shown that our prediction yielded somewhat consistent patterns across different discrete emotions in Study 1, in Study 2 we focused on two pleasant emotions (i.e., happiness and calmness) and two unpleasant emotions (i.e., sadness and anxiety). Both depressed and nondepressed participants reported their concurrent experienced emotions, desired emotions, and motivation (i.e., desirability and effort) in emotion regulation. We hypothesized that in nondepressed individuals, motivation to regulate emotions would be higher the larger the discrepancies between experienced and desired emotions. We also hypothesized that this association would be significantly attenuated among depressed individuals.

Method

Participants

The study was part of a larger project on emotion regulation in daily life among depressed and nondepressed individuals (see Mizrahi Lakan et al., 2023). For the larger project, we preregistered the recruitment of a minimum of 102 participants to detect a medium effect size of $\eta_p^2 = .05$ for between-group differences with a mixed design. Participants were recruited from the participant pool at the Hebrew University. To determine potential eligibility, students completed the Patient Health Questionnaire-9 (PHQ-9; Kroenke & Spitzer, 2002) prior to the beginning of the study. Students who scored 10 or above and those who scored 5 or below on the PHQ-9 were invited for a diagnostic examination. These two groups were recruited to potentially meet diagnostic criteria for the depression and healthy control groups, respectively.

The diagnostic interview was audiotaped and conducted over the phone by trained clinical psychology graduate students, due to COVID-19 restrictions. We used the Mini International Neuropsychiatric Interview 5.0.0 (M.I.N.I.; Sheehan et al., 1998) to determine participants' depression status. Individuals with Bipolar I or II diagnoses or any psychotic disorder were excluded. We randomly selected 20% of interviews for reliability assessment and evaluators agreed on 93% of diagnoses, $\kappa = .80$, $p < .001$. The depressed group included individuals diagnosed with current major depressive disorder (MDD) and the healthy control group included participants with no lifetime history of mental health disorders.

The study included 58 participants diagnosed with current MDD (75.9% female; $M_{age} = 25.52$, $SD_{age} = 4.57$; 53.4% employed) and 62 healthy controls (74.2% female; $M_{age} = 24.60$, $SD_{age} = 2.87$; 54.8% employed). All participants were university students and Israeli Jewish adults. Participants in the depressed group had significantly higher PHQ-9 scores than the healthy controls, but there were no significant differences between groups in gender, age, education level, or employment status (see Table 2 in Millgram et al., 2023, for additional demographic information and clinical characteristics). Regarding compliance, participants completed, on average, 79.28% of the surveys ($SD = 17.58\%$).

Procedure

The study included 10 days of EMAs. Participants completed four assessments per day (40 occasions per participant). Surveys were sent daily to mobile phones via SMS messages at 10:00 a.m., 2:00 p.m., 6:00 p.m., and 9:00 p.m., and were available for 1 hr. Participants received ~$1 for each completed EMA survey and received up to $40 for completing the entire EMA portion. On each occasion, participants rated their experienced emotions, desired emotions, and motivation in emotion regulation (i.e., desirability and effort). Participants also completed additional measures that were less relevant to the current research questions.

Measures

All measures were assessed on a 1 (*not at all*) to 9 (*very much*) scale.

Experienced Emotions. Participants indicated their positive ("*to what extent did you feel good?*") and negative ("*to what extent did you feel bad?*") emotions in the past 2 hr.[5]

[5] To assess current experiences of discrete emotions, we asked participants to report the extent to which they felt sad, happy, anxious, and calm, right now (e.g., "To what extent do you feel happy right now?"), respectively. We do not report these measures in the main text to test our key hypotheses because this measure of experienced emotions does not map onto the timeframe used to measure desired emotions ("right now" vs. "past 2 hr"). Nonetheless, in an exploratory fashion, we used these measures to compute discrete discrepancy scores, matching discrete experienced emotion to the same discrete desired emotion. We then repeated the main analyses using this alternative set of discrepancy scores and found similar pattern of results (these analyses are reported in the online supplemental materials).

Desired Emotions. Participants indicated the extent to which they wanted to feel two unpleasant emotions (sadness and anxiety; $\omega_{within} = .59$, $\omega_{between} = .75$) and two pleasant emotions (happiness and calmness; $\omega_{within} = .63$, $\omega_{between} = .85$) in the past 2 hr ("to what extent did you want to feel happiness?"). Participants rated the desirability of sadness, happiness, anxiety, and calmness. We selected these emotions because they represented each quadrant in the affective circumplex (Russell & Barrett, 1999).

Motivation in Emotion Regulation. To measure motivation in prohedonic emotion regulation, participants rated the desirability of regulation: "in the last 2 hr, to what extent did you want to decrease your negative emotions" and "in the last 2 hr, to what extent did you want to increase your positive emotions." Participants also rated the effort they invested in emotion regulation: "in the last 2 hr, to what extent did you invest effort to decrease your negative emotions?" and "in the last 2 hr, to what extent did you invest effort to increase your positive emotions?" We averaged the desirability and effort items to represent motivation to decrease unpleasant emotions ($\omega_{within} = .82$, $\omega_{between} = .88$) and to increase pleasant emotions ($\omega_{within} = .76$, $\omega_{between} = .89$), respectively.[6]

Analyses

Estimating the Discrepancies Between Experienced and Desired Emotions

We computed separate discrepancy scores for unpleasant and pleasant emotions by subtracting experienced unpleasant (or pleasant) emotions from desired unpleasant (or pleasant) emotions. Figure S2 in the online supplemental materials displays the distribution and frequency of discrepancy scores for unpleasant and pleasant emotions, by depression status. Across the entire sample, on average, participants felt more unpleasant than desired (discrepancy scores < 0) about 65% of the time, and less pleasant than desired (discrepancy scores > 0) about 60% of the time. Similar to Study 1, contrahedonic emotion regulation was relatively rare compared to prohedonic emotion regulation: In only 3% of the time, participants reported wanting to feel more unpleasant emotions than they experienced, and in 24% of the time, participants reported wanting to feel less pleasant emotions than they experienced.

To test whether discrepancy scores differed between depressed and nondepressed participants, we ran separate random-intercept models for unpleasant and pleasant emotions. Compared to nondepressed individuals, depressed individuals reported larger discrepancies between experienced and desired unpleasant ($M_{depressed} = -2.29$, $SD_{depressed} = 2.18$; $M_{nondepressed} = -1.13$, $SD_{nondepressed} = 1.59$) and pleasant ($M_{depressed} = 1.55$, $SD_{depressed} = 2.48$; $M_{nondepressed} = .57$, $SD_{nondepressed} = 2.10$) emotions, $ps < .001$. Given that we focused on prohedonic emotion regulation, we excluded from further analyses observations in which participants reported feeling less unpleasant or more pleasant than they desired (this resulted in excluding ~3% of total observations for unpleasant emotions and 24% of total observations for pleasant emotions). Included and excluded observations did not differ in terms of sample characteristics (e.g., depression status, age, or gender), $ps > .153$. Next, to ease interpretation, we calculated the absolute values of discrepancy scores, so that for both unpleasant and pleasant discrepancy scores, higher numbers reflect greater discrepancies between experienced and desired emotions.

Multilevel Models

We used the same analytical approach used in Study 1 to analyze the data, with one exception. In multilevel models, we included random slopes of both discrepancies and motivation at the previous assessment. Slopes of other Level 1 predictors (i.e., experienced emotions and desired emotions) were fixed to facilitate convergence. Following Study 1, we also conducted multilevel response surface analyses on the subgroups separately (depressed and nondepressed individuals). These analyses yielded similar patterns of results (see the online supplemental materials).

Discrepancies Between Experienced and Desired Emotions and Motivated Emotion Regulation in Depressed and Nondepressed Individuals

Table 3 presents the descriptive statistics and correlations. As shown in Table 4, the cross-level interaction between discrepancies and depression on motivation was significant for both unpleasant emotions, $B = -0.21$, $SE = 0.07$, $p = .004$, 95% CI [−0.36, −0.07], $R^2 = .009$, and pleasant emotions, $B = -0.14$, $SE = 0.07$, $p = .004$, 95% CI [−0.27, −0.003], $R^2 = .004$. Figure 2 displays the interaction plots and results from simple slope tests. As shown in Figure 2A, although the association between motivation and discrepancies was not statistically significant in either the nondepressed or the depressed groups, the strength of this association was significantly stronger among nondepressed individuals, $B = 0.87$, $SE = 0.68$, $p = .201$, 95% CI [−0.46, 2.21], than among depressed individuals, $B = 0.66$, $SE = 0.68$, $p = .334$, 95% CI [−0.67, 1.99]. With respect to pleasant emotions (see Figure 2B), the larger the discrepancies between experienced and desired pleasant emotions, the more nondepressed participants were motivated to increase their pleasant emotions, $B = 0.34$, $SE = 0.17$, $p = .043$, 95% CI [0.01, 0.67]. In contrast, no such association was found among depressed individuals, $B = 0.21$, $SE = 0.17$, $p = .214$, 95% CI [−0.12, 0.54]. Together, these findings demonstrate that engagement in prohedonic emotion regulation was less sensitive to regulatory needs (i.e., size of the discrepancies between experienced and desired emotions) among depressed than nondepressed individuals.

These interactions qualified several main effects. The main effect of discrepancies on motivation was significant for pleasant emotions, $B = 0.34$, $SE = 0.17$, $p = .043$, 95% CI [0.01, 0.67], $R^2 = .013$, but not for unpleasant emotions, $B = 0.87$, $SE = 0.68$, $p = .201$, 95% CI [−0.46, 2.21], $R^2 = .007$. Thus, greater discrepancies between experienced and desired pleasant emotions were linked to a stronger motivation to increase pleasant emotions. Additionally, the main effect of depression was significant for both unpleasant emotions, $B = 1.03$, $SE = 0.28$, $p < .001$, 95% CI [0.49, 1.58], $R^2 = .088$, and pleasant emotions, $B = 0.68$, $SE = 0.31$, $p = .028$, 95% CI [0.08, 1.29], $R^2 = .044$, indicating that depressed individuals were more motivated to decrease unpleasant emotions and increase pleasant emotions than nondepressed individuals were.

[6] When analyzed separately, results on desirability and effort did not replicate the results on the composite scores. A detailed account and discussion of these results appear in the online supplemental materials. We also discuss these differences in the General Discussion section.

Table 3
Descriptive Statistics and Zero-Order Correlations Between Variables for Unpleasant and Pleasant Emotions (Study 2)

Variables	ICC	*M*	$SD_{between}$	SD_{within}	1	2	3	4	5
Unpleasant emotions (UE)									
1. Depression									
2. UE discrepancies	.36	1.78	1.20	1.43	.50***	—	−.14***	.49***	.38***
3. Desired UE	.32	1.28	.44	0.42	.27**	.31***	—	.21***	.01
4. Experienced UE	.55	2.44	1.27	1.00	.56***	.77***	.56***	—	.26***
5. Mot. to decrease UE	.44	3.32	1.55	1.58	.29**	.53***	.22*	.53***	—
Pleasant emotions (PE)									
1. Depression									
2. PE discrepancies	.35	1.79	1.06	1.32	.40***	—	.37***	−.42***	.10***
3. Desired PE	.64	6.49	1.55	1.11	−.25**	.28**	—	.30***	.25***
4. Experienced PE	.55	4.62	1.54	1.31	−.54***	−.44***	.66***	—	.07***
5. Mot. to increase PE	.56	3.51	1.63	1.36	.14	.25**	.29**	.02	—

Note. Depression: 0 = *nondepressed*, 1 = *depressed*. Total number of observations: $n_{pleasant\ emotions} = 2{,}860$. $n_{unpleasant\ emotions} = 3{,}633$. Correlations below the diagonal are between-person correlations. Correlations above the diagonal are within-person correlations. ICC = intraclass correlation, which reflects the proportion of variance at the between-person level; UE = unpleasant emotions; PE = pleasant emotions; Mot. = motivation.
** $p < .01$. *** $p < .001$.

Discussion

Consistent with Study 1, we found that when regulating pleasant emotions, as discrepancies between experienced and desired emotions increase (i.e., regulatory needs get stronger), nondepressed individuals were more motivated to increase their pleasant emotions. In contrast, the motivation of depressed individuals to increase pleasant emotions remained consistently high, regardless of their regulatory needs. We observed a similar pattern with the regulation of unpleasant emotions, such that the motivation to decrease unpleasant emotions was relatively more sensitive to the size of discrepancies between experienced and desired emotions among nondepressed individuals, compared to depressed individuals.

Study 2 has some strengths. First, it tested the hypothesis by comparing motivated emotion regulation between participants clinically diagnosed with depression and those without clinical depression. Second, it included stronger measures of motivation, by assessing both the desire to regulate and the effort invested in doing so. However, Study 2 also has some limitations. To calculate discrepancy scores, we used either overlapping experienced and desired states (i.e., unpleasant and pleasant emotions vs. sadness, anxiety, calmness, happiness) that targeted the exact same sampling window (i.e., past 2 hr), or the exact same experienced and desired states (i.e., sadness, anxiety, calmness, and happiness) that targeted an overlapping sampling window (i.e., now vs. the past 2 hr). Both of these analyses yielded similar patterns of results, which were largely consistent with the results of Study 1. Additionally, compared to Study 1, where contrahedonic emotion regulation occurred less than 10% of the time for both unpleasant and pleasant emotions, in Study 2, contrahedonic emotion regulation occurred at a low frequency for unpleasant emotions (3%), but at a

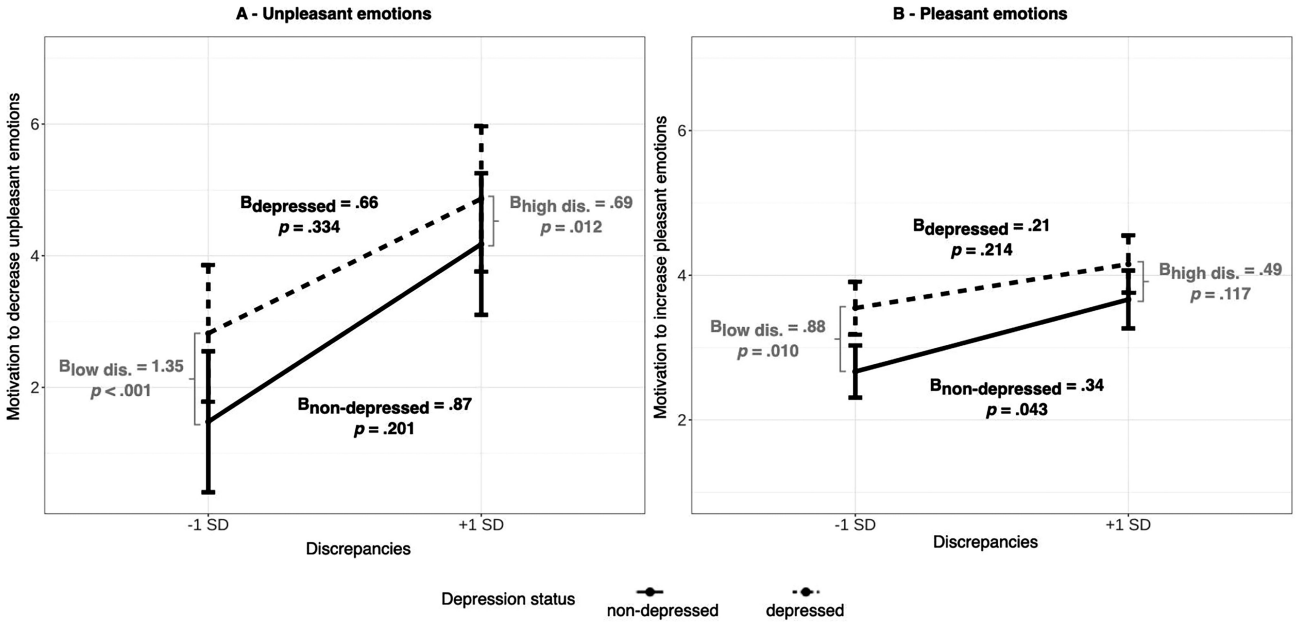
Table 4
Results of Multilevel Analyses (Study 2)

	Dependent variable							
	Motivation to decrease unpleasant emotions				Motivation to increase pleasant emotions			
Variables	Estimate (*SE*)	*p*-value	95% CI	R^2	Estimate (*SE*)	*p*-value	95% CI	R^2
Fixed effects								
Level 1 (within-level)								
Intercept	3.01 (0.21)	<.001	[2.59, 3.43]	—	3.45 (0.26)	<.001	[2.94, 3.96]	—
Discrepancies	0.87 (0.68)	.201	[−0.46, 2.21]	.007	0.34 (0.17)	.043	[0.01, 0.67]	.013
Experienced emotions	−0.32 (0.68)	.638	[−1.65, 1.01]	.001	0.27 (0.16)	.100	[−0.05, 0.59]	.011
Desired emotion	0.44 (0.68)	.513	[−0.88, 1.77]	.002	−0.003 (0.16)	.982	[−0.32, 0.31]	.000
DV_{t-1}	0.12 (0.02)	<.001	[0.07, 0.17]	.014	0.10 (0.03)	.001	[0.05, 0.16]	.008
Level 2 (between-level)								
Depression[a]	1.03 (0.28)	<.001	[0.49, 1.58]	.088	0.68 (0.31)	.028	[0.08, 1.29]	.044
Gender[b]	−0.29 (0.31)	.360	[−0.89, 0.32]	.006	−0.44 (0.35)	.211	[−1.14, 0.25]	.015
Age	0.03 (0.04)	.340	[−0.04, 0.10]	.006	0.06 (0.04)	.164	[−0.02, 0.13]	.020
Cross-level interaction								
Discrepancies × Depression	−0.21 (0.07)	.004	[−0.36, −0.07]	.009	−0.14 (0.07)	.048	[−0.27, −0.003]	.004
Random effects								
Intercept	2.17 (1.47)				2.63 (1.62)			
Discrepancies	0.08 (0.29)				0.05 (0.23)			
DV_{t-1}	0.02 (0.14)				0.03 (0.16)			
Residual	2.17 (1.47)				1.79 (0.07)			

Note. *p*-value smaller than .05 is statistically significant. DV = dependent variable.
[a] Depression was coded 0 = *nondepressed*, 1 = *depressed*. [b] Gender was coded 0 = *female*, 1 = *male*.

Figure 2

Motivation in Emotion Regulation as a Function of Depressive Status and Discrepancies Between Experienced and Desired Emotions, for Unpleasant (A) and Pleasant (B) Emotions (Study 2)



Note. Numbers in black represent results from simple slope analyses, and numbers in grey display results from the simple effect tests. For discrepancies in unpleasant emotions: $-1\ SD = -1.46, +1\ SD = 1.60$. For discrepancies in pleasant emotions: $-1\ SD = -1.43, +1\ SD = 1.45$. Disc. = discrepancies between experienced and desired emotions.

higher frequency for pleasant emotions (20%). This difference might be due to the unique clinical characteristics of our sample in Study 2.

General Discussion

Emotion regulation involves modifying experienced emotions to bring them in line with desired emotions. Desired emotions shape the direction of emotion regulation, influencing how people subsequently feel (Tamir, 2021). But what determines how driven people are to pursue their desired emotions? In two studies examining emotion regulation in daily life using EMAs, we found that among individuals with lower depressive symptoms or nondepressed individuals, larger discrepancies between experienced and desired emotions were associated with higher motivation in emotion regulation. This association, however, was not observed among individuals prone to depression (i.e., those with higher depressive symptoms) or clinically depressed individuals. In these individuals, motivation in emotion regulation not only remained consistently higher, but was less sensitive to regulatory demands.

Implications for Understanding Motivated Emotion Regulation

Whereas most research on emotion regulation focuses on the selection and implementation of regulatory strategies, the current investigation focuses on the initial stage of emotion regulation—namely, what leads people to initiate and invest effort in emotion regulation. In motivated emotion regulation, discrepancies between experienced and desired emotions signal regulatory needs and should calibrate effort in emotion regulation (Tamir, 2021). Larger discrepancies signal stronger needs that should boost motivation, and smaller discrepancies signal less pressing needs that should temper motivation and allow people to replenish their resources. Across two studies in the context of prohedonic emotion regulation, we found that the more what they felt differed from what they wanted to feel, the more healthy individuals were motivated (e.g., they invested more effort) to regulate their emotions. This pattern is consistent with general theories of goal pursuit (e.g., Carver & Scheier, 1981), according to which discrepancies between experienced and desired outcomes shape motivation. These results, therefore, provide empirical support to predictions of cybernetic approaches to emotion regulation (e.g., Tamir, 2021; Webb et al., 2012).

Implications for Understanding Emotion Regulation in Depression

Whereas nondepressed individuals were sensitive to the discrepancy between how they feel and how they want to feel, our findings demonstrate that this sensitivity is attenuated or even absent among individuals who are prone to depression (i.e., report higher depressive symptoms) or among those who suffer from clinical depression. These individuals may have difficulties calibrating motivation in emotion regulation to match regulatory needs. Compared to nondepressed individuals, depressed individuals were more motivated to regulate their emotions, but this motivation was mostly unrelated to the difference between their experienced and desired emotions. Depressed individuals were always motivated to change how they felt, even when their experienced emotions were relatively close to their desired emotions.

Prior work shows that unhealthy emotion regulation in depression involves the selection and implementation stages of emotion regulation. For example, depressed (vs. nondepressed) individuals are less capable of choosing context-appropriate regulatory strategies (e.g., Millgram et al., 2019) and use a less variable set of regulatory strategies (e.g., Southward & Cheavens, 2020). Our findings suggest that emotion regulation in depression might also involve the identification stage. Depressed (vs. nondepressed) individuals were less likely to match their motivation to changing demands in emotion regulation. This means that depressed individuals may invest effort to change their emotions even when they already feel how they want to feel. Similar to driving, where sticking your foot to the gas pedal can burn more gas and lead to fuel burnout, inflexible motivation in emotion regulation might result in the exhaustion of regulatory resources and potentially in emotion regulation failure—an issue that could be more prominent for depressed individuals who already experience deficits in regulatory resources (e.g., Joormann & Stanton, 2016).

Limitations and Future Directions

In two EMA studies, using slightly different measures, different designs, and different samples collected from different cultures, we found support for our hypotheses. Nonetheless, our research has several limitations. First, as the first attempt to investigate the association between discrepancies and motivated emotion regulation, Study 1 focused on motivation to influence emotions and Study 2 focused on motivation in prohedonic emotion regulation, as it is the most common form of emotion regulation in daily life and found to be rare in Study 1. Nonetheless, people sometimes engage in contrahedonic emotion regulation in daily life (Kalokerinos et al., 2017), and the frequency of such engagement might differ between pleasant and unpleasant emotions (see Figure S2 in the online supplemental materials). Future research should explore whether the findings in the present investigation replicate in contrahedonic emotion regulation.

Second, although both studies provide support for our hypotheses, there were some inconsistencies in the results. Specifically, the interaction between discrepancies and depressive symptoms was significant when predicting effort in Study 1, but in Study 2, this interaction was only significant when predicting the composite scores of desirability and effort, and was not significant when predicting effort individually (see Footnote 6 and the online supplemental materials). This failure to replicate the effects with effort highlighted a crucial theoretical question. Conceptually, composite scores assume that items have equal weights, regardless of their loading value (DiStefano et al., 2009). Our composite score treated desirability and effort as equal indices of motivation. However, whereas desirability is a relatively direct measure of motivation (e.g., Gollwitzer, 1990), effort likely reflects the intensity of motivation as well as other factors that influence behavior, such as task difficulty, skills, and resources (e.g., Richter, 2013). Therefore, although desirability and effort are linked and both capture aspects of motivation (see Gutentag & Tamir, 2022), desirability may be a more direct index of motivation than effort. Consistent with these theoretical claims, in Study 2, correlations between discrepancies and desirability were stronger (for unpleasant emotions: $r_{between} = .55$, $r_{within} = .40$, $ps < .001$; for pleasant emotions: $r_{between} = .30$, $p = .001$, $r_{within} = .15$, $p < .001$) than correlations between discrepancies and effort (for unpleasant emotion: $r_{between} = .46$, $r_{within} = .30$, $ps < .001$; for pleasant emotions: $r_{between} = .15$, $p = .092$, $r_{within} = .02$, $p = .308$), $ps < .001$. If desirability is a stronger index of motivation than effort is, effects may be stronger with desirability than with effort.

Given that discrepancies were more weakly associated with effort than with desirability, it is plausible that we failed to detect a significant effect in Study 2 due to lack of power. In multilevel models, the size of the interaction effects when predicting effort in the two studies were similar (Study 1: $R^2_{unpleasant\ emotions} = .004$ and $R^2_{pleasant\ emotions} = .002$; Study 2: $R^2_{unpleasant\ emotions} = .004$ and $R^2_{pleasant\ emotions} = .003$). However, whereas Study 1 had 173 participants, with 56 EMA prompts per person, Study 2 had only 120 participants, with 40 EMA prompts per person. Thus, we might have been underpowered to detect the interaction on effort in Study 2. Future research could try to replicate the findings of Study 2 and test the effects on desirability and effort with a larger sample of depressed and nondepressed individuals.

Third, while we were able to show that individuals prone to depression (vs. those with fewer depressive symptoms) and depressed (vs. nondepressed) individuals were less flexible in responding to regulatory needs, we did not examine what underlies such effects. One possibility is that depressed individuals hypermonitor their emotions and as a result, they regulate emotions whenever there is any discrepancy between their experienced and desired emotions, regardless of its size. Indeed, depression is linked to hypermonitoring emotions (Boden & Thompson, 2015). Another possibility is that depressed individuals are not as skilled in estimating the size of the discrepancies between experienced and desired emotions. For instance, they may be less capable of detecting the absence of discrepancies, due to overgeneralizing threats (Bonanno et al., 2020), negative cognitive biases (Hallion & Ruscio, 2011), or a lack of emotional awareness (Boden & Thompson, 2015). As a result, even when the discrepancies between their experienced and desired emotions decrease or disappear, depressed individuals fail to adjust accordingly. Future work should investigate these and other possible accounts of the present findings.

Fourth, our findings also contribute to the literature by showing that depression is generally linked to context insensitivity (e.g., Kashdan & Rottenberg, 2010). For instance, depressed individuals show a lack of flexible responding across negative and positive emotions (Bylsma et al., 2008). However, this does not necessarily mean that depression is always associated with less sensitivity to context. In fact, there are instances where there is hypersensitivity to context in depression. For example, compared to nondepressed individuals, depressed individuals are likely to be more sensitive to errors in their performance (e.g., Steffens et al., 2001). Such findings highlight the importance of testing when and where there is (or is not) context insensitivity in depression, especially when it comes to emotion regulation—which can have a direct impact on mental health and well-being (e.g., Bonanno et al., 2020).

Finally, although we assessed motivation in emotion regulation, we did not assess its downstream consequences. For example, are people who are more motivated to regulate emotions also more likely to succeed in emotion regulation? Is greater motivation in emotion regulation linked to greater psychological well-being and fewer clinical symptoms? Future research could investigate these questions to understand the implications of motivation in emotion regulation.

Constraints on Generality

Although the patterns of results were consistent across two samples from two different countries, these samples were still limited to young adults. Additionally, although results with some discrete emotions showed similar patterns to the findings in the main text,

there were some discrepancies (see the online supplemental materials). In the future, it would be beneficial to test whether these findings could be generalized across different emotions that vary in valence and arousal, and across different age groups.

Conclusions

Consistent with the cybernetic approaches to emotion regulation, this research demonstrates that people who are not depressed calibrate their efforts in emotion regulation according to the difference between their experienced emotions and their desired emotions. The greater the difference between them, the more motivated they are to try to regulate their emotions. This, however, is less characteristic of individuals who are prone to depression or of individuals who are clinically depressed. Those individuals are less able to match their motivated efforts to regulatory needs, such that they consistently work harder to regulate their emotions, even when they do not necessarily need to.

References

Bates, D., Maechler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, *67*(1), 1–48. https://doi.org/10.18637/jss.v067.i01

Boden, M. T., & Thompson, R. J. (2015). Facets of emotional awareness and associations with emotion regulation and depression. *Emotion*, *15*(3), 399–410. https://doi.org/10.1037/emo0000057

Bonanno, G. A., Maccallum, F., Malgaroli, M., & Hou, W. K. (2020). The Context Sensitivity Index (CSI): Measuring the ability to identify the presence and absence of stressor context cues. *Assessment*, *27*(2), 261–273. https://doi.org/10.1177/1073191118820131

Bylsma, L. M., Morris, B. H., & Rottenberg, J. (2008). A meta-analysis of emotional reactivity in major depressive disorder. *Clinical Psychology Review*, *28*(4), 676–691. https://doi.org/10.1016/j.cpr.2007.10.001

Carver, C. S., & Scheier, M. F. (1981). *Attention and self-regulation: A control-theory approach to human behavior*. Springer Verlag.

Chen, S., & Bonanno, G. A. (2021). Components of emotion regulation flexibility: Linking latent profiles to depressive and anxious symptoms. *Clinical Psychological Science*, *9*(2), 236–251. https://doi.org/10.1177/2167702620956972

Dejonckheere, E., Mestdagh, M., Houben, M., Rutten, I., Sels, L., Kuppens, P., & Tuerlinckx, F. (2019). Complex affect dynamics add limited information to the prediction of psychological well-being. *Nature Human Behaviour*, *3*(5), 478–491. https://doi.org/10.1038/s41562-019-0555-0

DiStefano, C., Zhu, M., & Mindrila, D. (2009). Understanding and using factor scores: Considerations for the applied researcher. *Practical Assessment, Research, and Evaluation*, *14*, Article 20. https://doi.org/10.7275/da8t-4g52

Geeraerts, J. (2020, May 20). *Investigating careless responding detection techniques in experience sampling methods.* https://osf.io/d798j/

Girgus, J. S., & Yang, K. (2015). Gender and depression. *Current Opinion in Psychology*, *4*, 53–60. https://doi.org/10.1016/j.copsyc.2015.01.019

Gollwitzer, P. M. (1990). Action phases and mind-sets. In E. T. Higgins & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition: Foundations of social behavior* (Vol. 2, pp. 53–92). Guilford Press.

Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology*, *2*(3), 271–299. https://doi.org/10.1037/1089-2680.2.3.271

Gross, J. J. (2015). Emotion regulation: Current status and future prospects. *Psychological Inquiry*, *26*(1), 1–26. https://doi.org/10.1080/1047840X.2014.940781

Gruber, J., Harvey, A. G., & Gross, J. J. (2012). When trying is not enough: Emotion regulation and the effort–success gap in bipolar disorder. *Emotion*, *12*(5), 997–1003. https://doi.org/10.1037/a0026822

Gutentag, T., & Tamir, M. (2022). Putting effort into emotion regulation: Manipulating desirability and motivational intensity. *Affective Science*, *3*(4), 878–893. https://doi.org/10.1007/s42761-022-00155-0

Hallion, L. S., & Ruscio, A. M. (2011). A meta-analysis of the effect of cognitive bias modification on anxiety and depression. *Psychological Bulletin*, *137*(6), 940–958. https://doi.org/10.1037/a0024355

Hughes, J. (2017). *reghelper: Helper functions for regression analysis* (R package Version 0.3.3) [Computer software]. https://CRAN.Rproject.org/package=reghelper

Jaeger, B. C., Edwards, L. J., Das, K., & Sen, P. K. (2017). An R^2 statistic for fixed effects in the generalized linear mixed model. *Journal of Applied Statistics*, *44*(6), 1086–1105. https://doi.org/10.1080/02664763.2016.1193725

Joormann, J., & Stanton, C. H. (2016). Examining emotion regulation in depression: A review and future directions. *Behaviour Research and Therapy*, *86*, 35–49. https://doi.org/10.1016/j.brat.2016.07.007

Kalokerinos, E. K., Tamir, M., & Kuppens, P. (2017). Instrumental motives in negative emotion regulation in daily life: Frequency, consistency, and predictors. *Emotion*, *17*(4), 648–657. https://doi.org/10.1037/emo0000269

Kashdan, T. B., & Rottenberg, J. (2010). Psychological flexibility as a fundamental aspect of health. *Clinical Psychology Review*, *30*(7), 865–878. https://doi.org/10.1016/j.cpr.2010.03.001

Koole, S. L., Jostmann, N. B., & Baumann, N. (2012). Do demanding conditions help or hurt self-regulation? *Social and Personality Psychology Compass*, *6*(4), 328–346. https://doi.org/10.1111/j.1751-9004.2012.00425.x

Koval, P., Hinton, J., Dozo, N., Gleeson, J., Alvarez, M., Harrison, A., Vu, D., Susanto, R., Jayaputera, G., & Sinnott, R. (2019). *SEMA3: Smartphone Ecological Momentary Assessment* (Version 3) [Computer software]. http://www.sema3.com

Kroenke, K., & Spitzer, R. L. (2002). The PHQ-9: A new depression diagnostic and severity measure. *Psychiatric Annals*, *32*(9), 509–515. https://doi.org/10.3928/0048-5713-20020901-06

Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. (2017). Lmertest package: Tests in linear mixed effects models. *Journal of Statistical Software*, *82*(13), 1–26. https://doi.org/10.18637/jss.v082.i13

McCabe, C. J., Kim, D. S., & King, K. M. (2018). Improving present practices in the visual display of interactions. *Advances in Methods and Practices in Psychological Science*, *1*(2), 147–165. https://doi.org/10.1177/2515245917746792

Millgram, Y., Joormann, J., Huppert, J. D., & Tamir, M. (2015). Sad as a matter of choice? Emotion-regulation goals in depression. *Psychological Science*, *26*(8), 1216–1228. https://doi.org/10.1177/0956797615583295

Millgram, Y., Mizrahi Lakan, S., Joormann, J., Nahum, M., Shimony, O., & Tamir, M. (2023). Choosing to avoid the positive? Emotion regulation strategy choice in depression. *Journal of Psychopathology and Clinical Science*, *132*(6), 669–680. https://doi.org/10.1037/abn0000835

Millgram, Y., Sheppes, G., Kalokerinos, E. K., Kuppens, P., & Tamir, M. (2019). Do the ends dictate the means in emotion regulation? *Journal of Experimental Psychology: General*, *148*(1), 80–96. https://doi.org/10.1037/xge0000477

Mizrahi Lakan, S., Hu, D., Millgram, Y., Nahum, M., Shimony, O., & Tamir, M. (2023). *Emotion goals in depression and their pursuit in daily life* [Manuscript in preparation]. Department of Psychology, Hebrew University of Jerusalem.

Murayama, K., Usami, S., & Sakaki, M. (2022). Summary-statistics-based power analysis: A new and practical method to determine sample size for mixed-effects modeling. *Psychological Methods*, *27*(6), 1014–1038. https://doi.org/10.1037/met0000330

Nestler, S., Humberg, S., & Schönbrodt, F. D. (2019). Response surface analysis with multilevel data: Illustration for the case of congruence hypotheses. *Psychological Methods*, *24*(3), 291–308. https://doi.org/10.1037/met0000199

Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, *1*(3), 385–401. https://doi.org/10.1177/014662167700100306

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods sage* (2nd ed.). Sage Publications.

R Core Team. (2013). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. http://www.R-project.org/

Richter, M. (2013). A closer look into the multi-layer structure of motivational intensity theory. *Social and Personality Psychology Compass*, *7*(1), 1–12. https://doi.org/10.1111/spc3.12007

Russell, J. A., & Barrett, L. F. (1999). Core affect, prototypical emotional episodes, and other things called emotion: Dissecting the elephant. *Journal of Personality and Social Psychology*, *76*(5), 805–819. https://doi.org/10.1037/0022-3514.76.5.805

Sheehan, D. V., Lecrubier, Y., Sheehan, K. H., Amorim, P., Janavs, J., Weiller, E., Hergueta, T., Baker, R., & Dunbar, G. C. (1998). The Mini-International Neuropsychiatric Interview (M.I.N.I): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *The Journal of Clinical Psychiatry*, *59*(Suppl 20), 22–33.

Sheppes, G., Suri, G., & Gross, J. J. (2015). Emotion regulation and psychopathology. *Annual Review of Clinical Psychology*, *11*(1), 379–405. https://doi.org/10.1146/annurev-clinpsy-032814-112739

Southward, M. W., & Cheavens, J. S. (2020). Quality or quantity? A multistudy analysis of emotion regulation skills deficits associated with borderline personality disorder. *Personality Disorders: Theory, Research, and Treatment*, *11*(1), 24–35. https://doi.org/10.1037/per0000357

Steffens, D. C., Wagner, H. R., Levy, R. M., Horn, K. A., & Krishnan, K. R. R. (2001). Performance feedback deficit in geriatric depression. *Biological Psychiatry*, *50*(5), 358–363. https://doi.org/10.1016/S0006-3223(01)01165-9

Tamir, M. (2021). Effortful emotion regulation as a unique form of cybernetic control. *Perspectives on Psychological Science*, *16*(1), 94–117. https://doi.org/10.1177/1745691620922199

Vanderlind, W. M., Millgram, Y., Baskin-Sommers, A. R., Clark, M. S., & Joormann, J. (2020). Understanding positive emotion deficits in depression: From emotion preferences to emotion regulation. *Clinical Psychology Review*, *76*, Article 101826. https://doi.org/10.1016/j.cpr.2020.101826

van't Veer-Tazelaar, P. J. N., van Marwijk, H. W., Jansen, A. P. D., Rijmen, F., Kostense, P. J., van Oppen, P., van Hout, H. P., Stalman, W. A., & Beekman, A. T. (2008). Depression in old age (75+), the PIKO study. *Journal of Affective Disorders*, *106*(3), 295–299. https://doi.org/10.1016/j.jad.2007.07.004

Webb, T. L., Gallo, I. S., Miles, E., Gollwitzer, P. M., & Sheeran, P. (2012). Effective regulation of affect: An action control perspective on emotion regulation. *European Review of Social Psychology*, *23*(1), 143–186. https://doi.org/10.1080/10463283.2012.718134

Wright, R. A. (2008). Refining the prediction of effort: Brehm's distinction between potential motivation and motivation intensity. *Social and Personality Psychology Compass*, *2*(2), 682–701. https://doi.org/10.1111/j.1751-9004.2008.00093.x

Received July 1, 2023
Revision received December 23, 2023
Accepted December 29, 2023 ■