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# Emotion

## **Intensity, Desirability, and Attainability: Predictors of Effort in Emotion Regulation Among Healthy and Depressed Individuals**

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# Intensity, Desirability, and Attainability: Predictors of Effort in Emotion Regulation Among Healthy and Depressed Individuals

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Successful emotion regulation often requires effort. Yet, it is unclear what factors drive the investment of effort in emotion regulation and for whom. In a controlled experiment with healthy individuals ( $N = 63$ ) and a 10-day Ecological Momentary Assessment study involving both healthy and clinically depressed individuals ( $N = 184$ ), we tested whether investment of effort in emotion regulation depends on the perceived desirability (i.e., value attributed to the goal) and attainability (i.e., expectancy that the goal can be achieved) of emotion regulation goals, and whether goal desirability and attainability are shaped by emotional intensity. Findings supported our key hypotheses. First, more intense unpleasant emotions rendered the emotion regulation goal of decreasing unpleasant emotions more desirable but also less attainable. Second, both goal desirability and attainability predicted effort in emotion regulation, with desirability being a stronger predictor. Third, desirability and attainability interacted, such that attainability more strongly predicted effort when desirability was higher (vs. lower). Fourth, whereas these patterns were found among healthy individuals, they differed among clinically depressed individuals. Specifically, healthy individuals calibrated their investment of emotion-regulatory effort based on evaluations of the desirability and attainability of emotion regulation goals—both of which were sensitive to the intensity of their unpleasant emotions. In contrast, depressed individuals did not show the same calibration, potentially reflecting suboptimal allocation of emotion regulation resources in depression. Together, these findings show when people are likely to invest more effort in emotion regulation and how this differs in healthy individuals and those suffering from depression.

**Keywords:** effort, emotion regulation, motivation, depression

**Supplemental materials:** <https://doi.org/10.1037/emo0001700.supp>

Emotion regulation carries important implications for everyday functioning, social relationships, and psychological health (e.g., English et al., 2013; Tamir & Mauss, 2011). However, emotion regulation is often effortful (Tamir, 2021), leading people to avoid regulation at times, even when it is feasible (e.g., Milyavsky et al., 2019; Suri et al., 2015). To understand the process and outcomes of emotion regulation, therefore, it is important to identify the factors

that motivate people to invest effort in it. Building on motivational theories (e.g., Kruglanski et al., 2014), in this investigation, we test two key potential determinants of effort in emotion regulation—namely, the desirability and the attainability of emotion regulation goals, and assess how they are informed by emotional intensity. Furthermore, to examine potential links to dysfunctional emotion regulation, we assess these factors and their associations with

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Methods were preregistered in both studies (Study 1: <https://aspredicted.org/5xnk-yh8h.pdf>; Study 2: <https://aspredicted.org/jbq2-3hqj.pdf>). In both studies, the majority of hypotheses were preregistered, while the others were specified as exploratory. We report all deviations from the preregistrations in the supplemental materials. Data, materials, and analysis scripts are available at [https://osf.io/ntpze/?view\\_only=9bc47bd799024ef7b0ef8e9ecbc10cf6](https://osf.io/ntpze/?view_only=9bc47bd799024ef7b0ef8e9ecbc10cf6).

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equal role in conceptualization, investigation, methodology, resources, validation, writing—original draft, and writing—review and editing. Yair Nahari played a supporting role in formal analysis, project administration, and software and an equal role in investigation and resources. Cendri A. Hutcherson played a supporting role in conceptualization, writing—original draft, and writing—review and editing. Iris B. Mauss played a supporting role in writing—review and editing and an equal role in funding acquisition. Maya Tamir played a lead role in funding acquisition, investigation, project administration, resources, and supervision, a supporting role in formal analysis and visualization, and an equal role in conceptualization, methodology, validation, writing—original draft, and writing—review and editing.

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emotion regulation effort in both healthy and clinically depressed individuals. We focus specifically on explicit, consciously reportable forms of emotion regulation (rather than automatic or unconscious forms), which, according to theory, should require conscious effort for initiation and implementation (Gyurak et al., 2011).

### People Sometimes Avoid Emotion Regulation Because It Is Effortful

Emotion regulation can be initiated with the activation of an emotion regulation goal—namely, when people decide that they want to change their emotion in a specific direction (Gross, 2015). Yet, emotion regulation is not always initiated, even when such goals are activated. For example, ecological momentary assessment (EMA) studies suggest that people do not always engage in emotion regulation in daily life, even when they experience emotions they want to change (Daniel et al., 2024; Lai et al., 2026). Although there are several potential explanations for this, one possibility is that people may avoid initiating emotion regulation because it requires effort (Tamir, 2021). On average, individuals report a moderate level of effort investment in emotion regulation, both in daily life (Gutentag et al., 2026) and in laboratory settings (Scheffell et al., 2021). In fact, people mention effort aversion as one reason for not regulating their emotions. For example, participants reported they “did not want to put in the effort” (Daniel et al., 2024, p. 241) or that regulation “would have taken too much effort” (Lai et al., 2026, p. 305). Similar evidence has been observed in the laboratory, where participants were less likely to attempt emotion regulation as they perceived it to be more effortful (Milyavsky et al., 2019). Given effort aversion is one reason why people fail to engage in emotion regulation, understanding predictors of effort investment could provide valuable and practical insights into emotion (dys)regulation.

### The Desirability and Attainability of Emotion Regulation Goals

Considerable research has identified factors that drive effortful goal pursuit (e.g., Brandstätter et al., 2013; Heckhausen & Heckhausen, 2008). Many theories of motivation (e.g., Gollwitzer, 1990; Kruglanski et al., 2014) have highlighted the importance of goal desirability (i.e., the value attributed to goal achievement) and attainability (i.e., the perceived likelihood of goal achievement) as critical determinants of effortful goal pursuit.

Motivational theories typically consider goal desirability and attainability as independent, equivalent predictors of effortful goal pursuit, with greater effort directed toward goals when they are seen as more desirable or attainable (for a review and detailed discussion, see Kruglanski et al., 2014). Indeed, experimental manipulations of either desirability or attainability can shape subsequent effortful behavior in goal pursuit (e.g., Bélanger et al., 2016; Gartzia et al., 2021). However, some have proposed that goal desirability and attainability not only carry different weights in predicting effortful behavior, but also may interact to influence it. For example, motivational readiness theory (Kruglanski et al., 2014) proposes that desirability should play a major role in predicting effort—such that a minimal level of desirability must be met in order for effortful action to arise—whereas attainability serves an assisting role. Specifically, when goal desirability is absent or very low, attainability would not matter. However, as desirability increases, attainability becomes a

more influential predictor. These predictions are important as they potentially describe how individuals align their actions with priorities and optimize resources to achieve success in goal pursuit. Thus, goal desirability and attainability may have both independent (but potentially different) and interactive effects on effortful goal pursuit.

To date, these insights have not yet been systematically tested in the context of emotion regulation. The evidence that does exist has largely focused on goal desirability, with research supporting the idea that the desirability of emotion regulation goals results in greater initiation of effortful emotion regulation behaviors (e.g., exposing oneself to more calm images when wanting to feel calmer), and implementing regulatory behavior in the service of changing emotions (e.g., using emotion regulation strategies more intensely, Gutentag & Tamir, 2022; Gutentag et al., 2024, 2026). Far fewer studies have tested the role of goal attainability in emotion regulation. To date, only one study has directly investigated this question, focusing on the regulation of empathy rather than emotion more generally. The study found that health professionals who perceived increasing their empathy as more attainable were more likely to exert effort to experience it (Gutentag et al., 2024). To our knowledge, no studies to date have simultaneously examined the role of both goal desirability and attainability in effortful emotion regulation across a variety of emotions.

In this investigation, we build on prior work and test whether both goal desirability and attainability jointly predict effort in emotion regulation. We sought to answer three questions: Do these factors have independent effects on effort? Is desirability a stronger predictor of effort compared to attainability? And do they interact to predict effort in emotion regulation?

### Intensity of Unpleasant Emotions and the Desirability and Attainability of the Goals to Decrease Them

In emotion regulation, the intensity of unpleasant emotions should shape both the desirability and attainability of emotion regulation goals—particularly efforts to decrease unpleasant emotions. According to the mood-behavior model (Gendolla, 2000, 2025), affective states can inform effort mobilization in two ways. First, they can have a *directive impact* on behavior, such that unpleasant feelings facilitate greater investment of effort in activities likely to result in prohedonic affect regulation (e.g., Silvestrini & Gendolla, 2007). Second, affective states can have an *informational impact* on behavior, such that unpleasant feelings lead people to judge task difficulty as higher or their ability to perform the task as lower. By extension, a directive impact should lead to more (vs. less) intense unpleasant emotions to increase the desirability of prohedonic emotion regulation goals, and an informational impact should lead unpleasant emotions to decrease the attainability of prohedonic emotion regulation goals.

Consistent with these predictions, research suggests that intense unpleasant emotions could amplify the potential rewards of prohedonic emotion regulation (e.g., Eldar et al., 2016), and thus, increasing goal desirability. Moreover, intense unpleasant emotions should be more depleting, rendering prohedonic emotion regulation harder (Silvers et al., 2015) and thus decreasing goal attainability. Therefore, we predicted that more (vs. less) intense unpleasant emotions should render the emotion regulation goal of decreasing unpleasant emotions more desirable, but also less attainable.

## Effort in Emotion Regulation in Depression

When, whether, and how much people invest effort in emotion regulation may be critical to its success. Impairments in calibrating effort to potential payoff—specifically, inability to gauge and exert the proper amount of effort based on regulatory needs—could lead to regulation failure or inefficient resource investment (e.g., Sheppes et al., 2014). Major depressive disorder (MDD) may be particularly relevant for understanding unhealthy patterns of effort investment in emotion regulation (Joormann & Stanton, 2016). Indeed, evidence has linked emotion regulation deficits in MDD to a miscalibration of regulatory effort. For example, in emotion regulation, the need to regulate increases as one's experienced emotions deviate more from one's desired emotions. Whereas allocation of effort in emotion regulation is sensitive to such regulatory needs among healthy individuals, depressed individuals work hard to regulate their emotions, even when they already feel what they want to feel (Hu et al., 2024). Similarly, the association between momentary unpleasant affect and the likelihood of endorsing the goal to decrease unpleasant emotions was weaker among depressed (vs. healthy) individuals (Liu et al., 2023), suggesting that effortful emotion regulation may be less calibrated to online emotional experiences in depressed individuals. Despite evidence of miscalibrated emotion regulation efforts in MDD, the drivers of effort allocation in depressed versus healthy individuals remain unclear.

Based on the analysis above, effort calibration in emotion regulation might go awry in at least two ways. First, if the motivation to make oneself feel better fails to adequately track changes in one's unpleasant emotional experiences, this could lead people to invest effort when it is not needed, or fail to invest effort when it is. That is, the extent to which the intensity of unpleasant emotions predicts the evaluations of emotion regulation goals (e.g., their desirability or attainability) may differ between depressed and healthy individuals. Second, how much effort people invest should depend not only on the desirability but also the attainability of their emotion regulation goals. If the regulator fails to consider both when calibrating effort—for instance, investing effort when attainability is high but desirability is low—the investment can be suboptimal, because people waste resources to achieve a goal they do not actually desire (Kruglanski et al., 2014). Such miscalibration of effort might occur when the regulator is less sensitive to their own experiences or desires—which is characteristic of MDD (e.g., Rømer Thomsen et al., 2015). To investigate these possibilities, we compared predictors of effort in emotion regulation in healthy individuals and individuals with MDD.

We tested how the intensity of unpleasant emotions predicts goal desirability and attainability in emotion regulation, and how these goal evaluations shape the investment of emotion regulation efforts, among healthy and depressed individuals. We expected that evaluations of emotion regulation goals (i.e., their desirability and attainability) would be less sensitive to the intensity of unpleasant emotions among individuals with MDD (vs. healthy individuals). In addition, we hypothesized that the calibration of effort may depend on the interaction between goal desirability and attainability among healthy individuals, such that goal attainability may only matter when desirability is higher. This process, which reflects optimization of regulatory resources, might be less characteristic of MDD.

## The Current Investigation

We hypothesized that the likelihood of people investing effort in emotion regulation depends on both the desirability and attainability of emotion regulation goals, both of which are shaped by emotional intensity (particularly the intensity of unpleasant emotions). To test these hypotheses, we conducted two studies in which we either manipulated (Study 1) or measured (Study 2) emotional intensity and assessed the desirability and attainability of emotion regulation goals, and effort in emotion regulation. We focused on attempts to decrease unpleasant emotions as these are most common in emotion regulation (Kalokerinos, Tamir, & Kuppens, 2017) and are a central goal in individuals with MDD (e.g., Joormann & Stanton, 2016).

We tested several hypotheses. First, we predicted that more intense unpleasant emotions would render prohedonic emotion regulation goals (i.e., decreasing unpleasant emotions) more desirable (Hypothesis 1). Second, we predicted that more intense unpleasant emotions would render prohedonic emotion regulation goals less attainable (Hypothesis 2). Third, we predicted that both desirability and attainability would predict more effort in emotion regulation, but that the effect of desirability would be stronger than that of attainability (Hypothesis 3a). We also tested whether desirability and attainability interact to predict effort, such that when desirability is low, attainability would not be associated with effort. However, as goal desirability increases, greater attainability would predict increased effort (Hypothesis 3b). Finally, in Study 2, we examined whether the links between unpleasant emotions and desirability and attainability (Hypotheses 1 and 2), as well as the associations between desirability and attainability and effort in emotion regulation (Hypotheses 3a and 3b), are moderated by depression.

## Measuring Effort in Emotion Regulation

Because mental effort is an internal psychological process involving the allocation of limited cognitive resources, it cannot be measured directly (for a review on measuring effort in self-regulation, see Thomson & Oppenheimer, 2022). Therefore, building on the existing literature, the present research employed a combination of several measures as indicators of effort. First, effort can be reflected in individuals' decision to initiate regulation (e.g., Gollwitzer, 1990; Shenhav et al., 2013). Research in self-regulation suggests that effort investment in goal pursuit involves weighing the costs of exerting effort against the potential benefits that may accrue as a result (e.g., Shenhav et al., 2013). This cost–benefit analysis determines when and how much mental effort individuals invest in initiating and maintaining goal-directed behavior. In this respect, the initiation of regulation indicates that a threshold has been reached at which the perceived benefits outweigh the costs, and the individual is willing to commit to the chosen goal and invest resources toward its attainment (e.g., Gollwitzer, 1990, 2012; Heckhausen & Gollwitzer, 1987). Thus, the decision to initiate goal pursuit marks the transition from zero to above-threshold effort investment and can serve as a behavioral choice index of effort (vs. none). However, it does not indicate the amount of effort individuals exert once they decide to invest it.

Second, effort can be measured through self-reports, by directly asking people to rate how much effort they have invested in performing a regulation task. Subjective ratings of effort have high face validity, have been shown to converge with other indicators of effort—such as physiological measures (e.g., heart rate and pupil

dilation; Hogervorst et al., 2014)—and are easy to implement. However, these measures are more susceptible to social desirability biases and rely on accurate introspection.

Third, effort can be measured by the overall intensity of goal-directed behavior. Researchers can ask participants to report how intensely they used multiple regulatory strategies, with the aggregated intensity of these reports indexing the total effort invested (Meltzer et al., 2004). For instance, individuals who invest greater effort in losing weight may use a range of weight-loss strategies—such as dieting, exercising, and prioritizing sleep—more intensely. This approach has also been adapted to measure effort in the domain of emotion regulation (Gutentag et al., 2026). Reports of the overall intensity of goal-directed behavior, as an index of effort, are less susceptible to demand effects.

In this research, we employed a multimeasure approach, leveraging complementary strengths to provide valid and converging evidence. Study 1 assessed effort in emotion regulation in an experimentally controlled laboratory study by tracking decisions to initiate emotion regulation (vs. not) in a healthy sample. Study 2 assessed effort in emotion regulation using EMAs in daily life—by tracking self-reports of subjective effort and effort in overall emotion regulation strategy use—in both healthy and clinically depressed participants.

### Transparency and Openness

Methods were preregistered in both studies (Study 1: <https://aspre-dicted.org/5xnk-yh8h.pdf>; Study 2: <https://aspredicted.org/jbq2-3hqq.pdf>). In both studies, Hypotheses 1, 2, and part of 3a were preregistered, and Hypothesis 3b was mentioned as exploratory. In Study 1, our preregistration included analyses of data on both prohedonic (i.e., decreasing unpleasant emotions) and contra-hedonic (i.e., decreasing pleasant emotions) emotion regulation. Because this article focuses on the former, we report analyses and results related to decreasing pleasant emotions in the [Supplemental Materials](#). Study 2 preregistration included MDD as an exploratory moderator.<sup>1</sup> Although both studies preregistered Hypothesis 3a to examine the association between desirability/attainability and effort, we did not preregister the prediction that the effect of desirability on effort would be stronger than that of attainability. A detailed preregistration deviation report, including explanations and interpretations of these deviations, as well as full reports of preregistered analyses not included in the main text, is provided in the [Supplemental Materials](#). We explained how we determined sample sizes, data exclusions, and all measures relevant to the present investigation. Data, materials, and analysis scripts are available at [https://osf.io/ntpze/?view\\_only=9bc47bd799024ef7b0ef8e9ecbc10cf6](https://osf.io/ntpze/?view_only=9bc47bd799024ef7b0ef8e9ecbc10cf6). Both studies were approved by the university's ethics committees.

### Study 1

Study 1 was a behavioral experiment conducted with a healthy sample. Participants viewed a series of images and decided whether to decrease their emotional reaction to each image or to view naturally. To isolate the effects of emotional intensity from other possible effects of exposure to emotional stimuli (e.g., familiarity, personal associations, etc.), we manipulated emotional intensity by directly informing participants about the intensity of each image,

before viewing it. Images were selected from a validated picture data set based on normative ratings (see below). Participants were informed about the emotional intensity of each image and then rated the desirability and attainability of decreasing their emotional reaction to the image. Next, participants decided whether they wanted to decrease their emotional reaction to the image or to view it naturally, then viewed the image and implemented their chosen action.

We predicted that when expecting more (vs. less) intense unpleasant stimuli, the desirability of a prohedonic emotion regulation goal (i.e., decreasing unpleasant emotional intensity) would be higher, but the attainability would be lower. We also predicted that both goal characteristics would independently predict emotion regulation effort, as indicated by the likelihood of choosing to engage in effortful emotion regulation. Specifically, participants would be more likely to engage in effortful emotion regulation (by choosing to decrease emotional reactions vs. not), the greater the desirability and the greater the attainability of doing so, and we expected the effect of desirability to be stronger than that of attainability. Finally, we explored a possible interaction between goal desirability and attainability. We expected that attainability would not inform emotion regulation effort when desirability is low, but as desirability increases, higher attainability would predict greater effort.

### Method

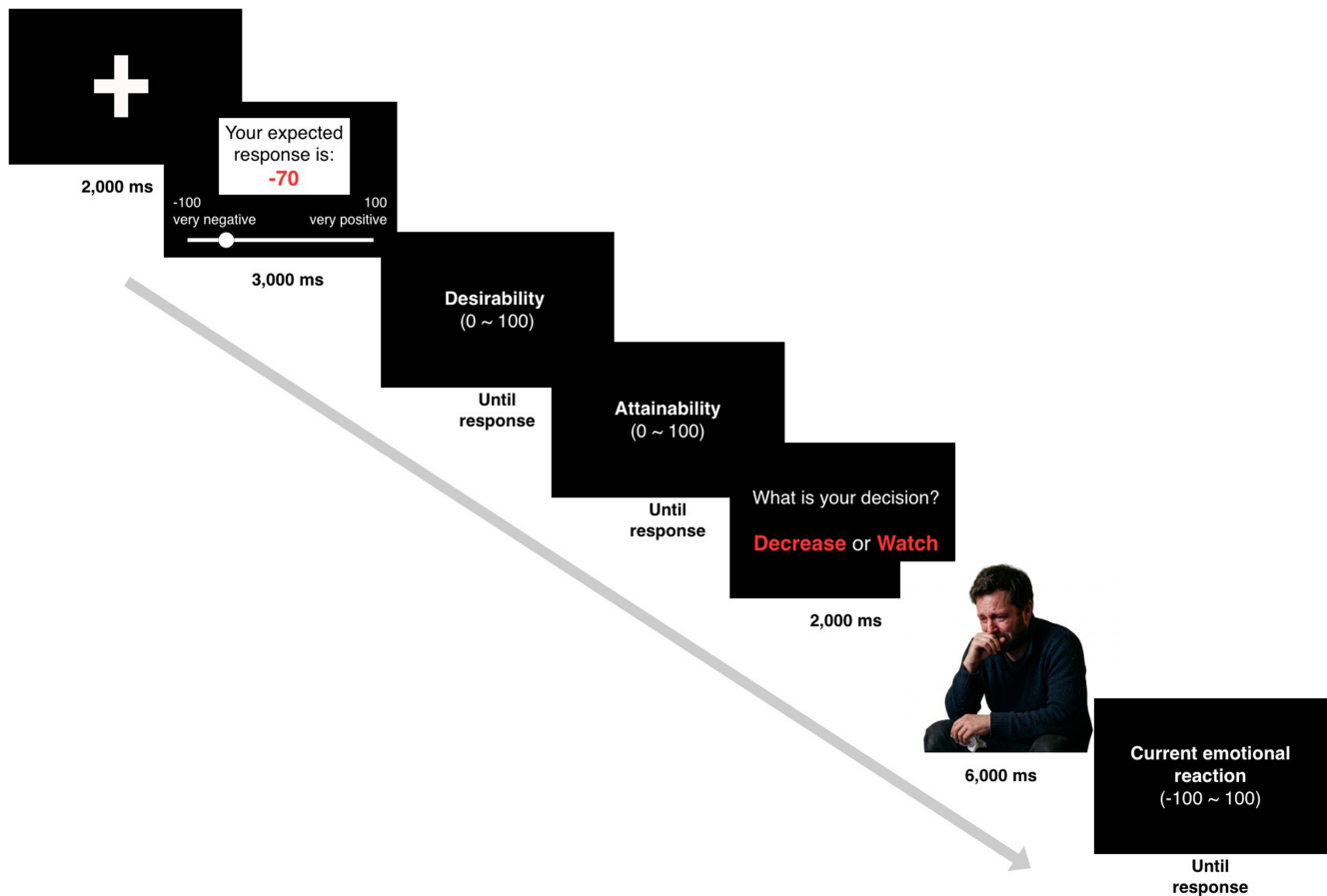
#### Participants

The final sample of participants included 63 university students (53 females and 10 males;  $M_{\text{age}} = 22.97$ ,  $SD_{\text{age}} = 1.45$ ). All participants were Jewish Israelis. We conducted a power analysis using G\*Power (Faul et al., 2009) for a within-subjects design with three factors, each having two levels. Results indicated that a sample of 54 would be required to detect a small effect size ( $\eta^2 = 0.02$ ,  $\alpha = .05$ , power = 80%). We recruited 64 participants from the university's pool, oversampling to ensure adequate power after potential exclusions. One participant was excluded for failing the attention check. Participants were compensated with ~\$11 or course credits.

#### Procedure and Measures

Figure 1 shows the key stages of the experimental procedure. After consenting, participants completed the emotion regulation task. Participants learned that in this task, they will see different images. Before viewing each image, we would inform them of the expected emotional reaction to the image. They were told that these expected reactions were based on the average reactions of previous participants who viewed the image and rated their emotional response to it. Reactions varied from  $-100$  (very negative) to  $100$  (very positive). The task began with two practice trials—one with an unpleasant image and the other with a pleasant image—in which participants were instructed to decrease their emotional reaction to

<sup>1</sup> We also measured depressive symptoms using the Center for Epidemiologic Studies Depression Scale in Study 1. However, depressive symptoms did not moderate any of the effects observed in Study 1. This may be due to the fact that Study 1 involved a relatively healthy sample, in which the distribution of depressive symptoms was highly right-skewed, resulting in few individuals with higher symptom levels.

**Figure 1***A Visual Depiction of the Experimental Procedure in Study 1*

*Note.* The image in Figure 1, depicting a sad person, was generated by Google Gemini [Version 2.5 Flash] for visual depiction. See the online article for the color version of this figure.

the images using cognitive reappraisal. Participants completed a total of 56 actual trials. On each trial (see Figure 1), participants were first presented with the expected emotional reaction to the image. Then they rated how much they wanted to decrease the intensity of their emotional reaction to the image (i.e., desirability, 0 = *not at all desirable*, 100 = *very desirable*) and the degree to which they believed they could decrease the intensity of their emotional response to the image (i.e., attainability, 0 = *not at all attainable*, 100 = *very attainable*). Next, participants chose whether to *decrease* their emotional reaction to the upcoming image or to *view* it naturally. Once participants made their choice, they saw the image for 6 s while implementing their chosen response (i.e., decrease emotional intensity vs. view naturally).<sup>2</sup> As a manipulation check, participants indicated whether they tried to decrease their emotional reaction or not while the picture was presented. Finally, participants rated their current emotional reaction on a scale of -100 (*most negative*) to 100 (*most positive*). After the emotion regulation task, participants provided demographic information, were debriefed, and thanked.

**Images.** A set of 56 pictures was selected from several validated picture sets, including International Affective Picture System

(Lang et al., 2008), Geneva Affective Picture Database (Dan-Glauser & Scherer, 2011), Emotional Picture Set (Wessa et al., 2010), and Nencki Affective Picture System (Marchewka et al., 2014).<sup>3</sup> Each of these databases contains images that have been rated

<sup>2</sup> Following the implementation of the selected choice, participants reported how much effort they invested in implementing their choice on each trial. As expected, regulation trials were rated as more effortful than no-regulation (i.e., watch) trials, showing that the decision to initiate emotion regulation corresponds with greater effort. We preregistered to assess whether desirability and attainability would interact to predict subjective reports of effort on regulation trials. However, across the entire sample and both valence types, regulation was chosen 52.64% of the time and “watch” was chosen 47.36% of the time. Therefore, this analysis was limited to approximately half of the number of trials, limiting statistical power. Indeed, no interaction effects were observed when assessing self-reported effort. These results are reported in the [Supplemental Materials](#).

<sup>3</sup> Image codes: International Affective Picture System: 1605, 1610, 1710, 1750, 2025, 2312, 2340, 2341, 2490, 2550, 2590, 3102, 3170, 3266, 4601, 4609, 4610, 4624, 5201, 6010, 6350, 6562, 7284, 7285, 7330, 7350, 8030, 8120, 8320, 8531, 9008, 9031, 9040, 9041, 9102, 9183, 9252, 9300, 9342, 9415, 9590, 9926. Geneva Affective Picture Database: H029, P042, P074. EmoPics: 10, 21, 24, 26, 234, 236, 241, 242, 244, 248. Nencki Affective Picture System: Animals\_166\_v.

on valence by a large and diverse sample. We used a linear transformation on each of these images, so that their valence will range from  $-100$  to  $100$ . The images were selected to create four distinct groups: Pleasant with low intensity ( $N = 14$ , range:  $17$ – $57$ ;  $M = 41.79$ ,  $SD = 12.56$ ), pleasant with high intensity ( $N = 14$ , range:  $58$ – $84$ ;  $M = 70.36$ ,  $SD = 9.29$ ), unpleasant with low intensity ( $N = 14$ , range:  $-29$  to  $-55$ ;  $M = -42.71$ ,  $SD = 8.42$ ), and unpleasant with high intensity ( $N = 14$ , range:  $-69$  to  $-90$ ;  $M = -81.57$ ,  $SD = 6.63$ ).

## Results

All analyses were conducted using R software (V 4.1.2; R Core Team, 2021).

### Manipulation Checks

First, we checked if people had more intense, unpleasant reactions to intensely unpleasant (i.e., more negative) images. To this end, we ran a multilevel model to account for the nested nature of the data (multiple trials nested within participants), using the *lmer()* function from the *lme4* package (Bates et al., 2015). We entered participants' emotional reactions rated at the end of each trial as the outcome and expected emotional intensity of images as the predictor. We included a random intercept for stimuli, a random intercept for participants, and a by-participant random slope for emotional intensity. As expected, participants reported more intense unpleasant reactions to more negative images,  $B = 41.89$ ,  $SE = 2.09$ ,  $p < .001$ , 95% CI [ $37.79$ ,  $45.99$ ].  $R^2 = .65$ .

Second, we checked if people followed their regulation decision properly (i.e., decrease or view). To this end, we examined how participants implemented their choice. We created a variable that indicates whether or not their action was congruent with their decision. Across the 3,528 trials, discrepancies between choice and action occurred in only 7% of trials ( $n = 250$ ;  $M = 9.50\%$ ,  $SD = 8.82\%$ ,  $\max = 44.64\%$ ), and 17 participants reported zero discrepancies. No participant deviated from their choice in more than 50% of the trials. Following our preregistration, we excluded choice-action incongruent trials, resulting in a data set with 3,271 trials.

Third, to test whether participants regulated their emotions when they said they would, we checked whether participants felt less unpleasant on trials where they chose to decrease their emotional intensity (vs. not). We ran another multilevel model, with emotional reactions entered as the outcome and regulation decision entered as the predictor, including a random intercept for stimuli and a random intercept for participants.<sup>4</sup> As expected, participants reported less intense unpleasant emotions on trials in which they chose to decrease their emotional reaction (vs. not),  $B = -6.19$ ,  $SE = 0.68$ ,  $p < .001$ , 95% CI [ $-7.51$ ,  $-4.86$ ].  $R^2 = .04$ .

### Main Analyses

Because the full data set included stimuli that varied by valence and assessed both prohedonic emotion regulation (i.e., decreasing unpleasant emotions) and contrahedonic emotion regulation (i.e., decreasing pleasant emotions), following our preregistration, we first tested whether the patterns involving these two types of emotion regulation were distinct. We did so by testing whether valence

moderated the effects of emotional intensity on emotion regulation goal desirability and attainability (Hypotheses 1 and 2, multilevel linear models), and whether the influence of goal desirability and attainability on effort (i.e., decisions to engage in effortful emotion regulation) varied as a function of valence (Hypothesis 3, multilevel logistic model). We used the *linearHypothesis()* function in R (Fox et al., 2024) to compare the log-odds coefficients of desirability and attainability in predicting effortful choice. In all three analyses, valence emerged as a significant moderator,  $ps \leq .028$ . This justified examining reactions to unpleasant images (i.e., prohedonic regulation) and pleasant images (i.e., contrahedonic regulation) separately. Given that this article targets prohedonic emotion regulation, we report analyses of reactions to unpleasant images below. Results for pleasant images—as well as the interactions with valence—are reported in the [Supplemental Materials](#).

[Supplemental Materials](#) present results based on the full data set. [Table 1](#) shows descriptive statistics and correlations among key variables, focusing on responses to unpleasant images. Desirability and attainability were not correlated at the between-person level, and showed only a weak correlation at the within-person level, suggesting that these two constructs are largely independent. Effortful regulation decisions exhibited a moderate correlation with desirability at both within- and between-person levels. Effortful regulation decisions also had a weak within-person correlation with attainability, but no significant correlation at the between-person level. These findings suggest that desirability and attainability are related to effort, but they are distinct constructs and should not be conflated with effort itself.

**Intensity of Unpleasant Stimuli and Desirability and Attainability of Emotion Regulation Goals.** As predicted and supporting Hypothesis 1, the more unpleasant the image was, the higher was the desirability of decreasing emotional intensity,  $B = 7.99$ ,  $SE = 0.96$ ,  $p < .001$ , 95% CI [ $6.10$ ,  $9.88$ ], see [Figure 2](#). Supporting Hypothesis 2, as the intensity of unpleasant images increased, the perceived attainability of decreasing emotional reactions decreased,  $B = -9.00$ ,  $SE = 0.89$ ,  $p < .001$ , 95% CI [ $-10.75$ ,  $-7.26$ ].

**Desirability and Attainability as Predictors of Effort in Emotion Regulation.** As reported in [Table 1](#), participants chose to decrease their emotional intensity 79.81% of the time. Consistent with Hypothesis 3a, the main effect of desirability was significant, odds ratios ( $OR$ ) = 11.25, 95% CI [ $6.91$ ,  $18.34$ ],  $p < .001$ , such that when decreasing unpleasant emotions was perceived as more desirable, people were more likely to engage in effortful emotion regulation (i.e., making the choice to decrease their emotional reactions vs. watching). However, inconsistent with Hypothesis 3a, the main effect of attainability was not significant,  $OR = 1.08$ , 95% CI [ $0.81$ ,  $1.43$ ],  $p = .614$ . Next, we probed the significant Desirability  $\times$  Attainability  $\times$  Valence three-way interaction using the *emmeans* package (Lenth & Piaskowski, 2026). When responding to unpleasant stimuli (i.e., attempted prohedonic emotion regulation), there was a significant interaction between desirability and attainability,  $OR = 4.76$ , 95% CI [ $1.72$ ,  $13.12$ ],  $p = .003$ . Supporting Hypothesis 3b (see [Figure 3](#)), when desirability was lower ( $-1$   $SD$  below the mean), attainability did not predict emotion regulation choice,  $OR = 0.73$ , 95% CI [ $0.46$ ,  $1.17$ ],  $p = .197$ .

<sup>4</sup> In all multilevel models, random effects that explained the least variance were removed to avoid convergence issues.

**Table 1***Descriptive Statistics and Correlations for Key Variables in Study 1*

| Variable                 | <i>M</i> | <i>SD</i> <sub>within</sub> | <i>SD</i> <sub>between</sub> | ICC  | 1     | 2       | 3       | 4      |
|--------------------------|----------|-----------------------------|------------------------------|------|-------|---------|---------|--------|
| Entire sample            |          |                             |                              |      |       |         |         |        |
| 1. Emotional intensity   | −61.36   | 20.33                       | 2.62                         |      | —     | −.38*** | .52***  | .02    |
| 2. Desirability          | 70.40    | 19.92                       | 17.08                        | 0.36 | −.03  | —       | −.20*** | .40*** |
| 3. Attainability         | 39.96    | 17.86                       | 18.22                        | 0.46 | −.30* | −.09    | —       | .09*** |
| 4. Effortful ER (binary) | 79.81%   |                             |                              |      | −.09  | .43***  | −.03    | —      |

*Note.* Correlations below the diagonal are between-person correlations. Correlations above the diagonal are within-person correlations. Effortful ER = effortful emotion regulation, with Watch (vs. Decrease) coded as the reference group. ICC = intraclass correlation.

\*  $p < .05$ . \*\*\*  $p < .001$ .

However, when desirability was higher (+1 *SD* above the mean), attainability significantly predicted the choice to regulate (vs. watch),  $OR = 1.60$ , 95% CI [1.16, 2.22],  $p = .004$ .

## Discussion

Study 1 provides causal support for our hypotheses. First, supporting Hypotheses 1 and 2, as unpleasant images become more intense, the desirability of decreasing emotional intensity increased, whereas the attainability of doing so decreased. These findings show that evaluations of the desirability and attainability of prohedonic emotion regulation goals are sensitive to the intensity of unpleasant emotions.

Second, supporting Hypothesis 3a, desirability was positively linked to effort in emotion regulation (i.e., the choice to engage in effortful emotion regulation), and this effect was stronger than the effect of attainability ( $p < .001$ ). Contrary to Hypothesis 3a, we did not find a main effect of attainability. Instead, consistent with Hypothesis 3b, when decreasing unpleasant emotions, attainability was linked to emotion regulation effort when desirability was higher and did not matter when desirability was lower. These findings suggest that in the context of prohedonic emotion regulation, people

are unlikely to invest effort in emotion regulation if the goal is not desirable, even if attainability is high.

Contrary to our hypothesis, Study 1 did not find a significant main effect of attainability. This may be because regulation in laboratory settings—where stimuli are less personally relevant—is relatively attainable, in general. This null effect may be due to the binary nature of the outcome, limiting statistical power. Therefore, in Study 2, we measured effort as a continuous outcome. Moreover, in assessing efforts to decrease emotional responses to both unpleasant and pleasant stimuli in Study 1, emotional intensity was measured using a bipolar scale (ranging from *very unpleasant* to *very pleasant*), which may have conflated mixed emotional states (Russell & Carroll, 1999). Focusing on unpleasant emotions and measuring them independently of pleasant emotions could reveal more accurate and potentially stronger effects. Therefore, in Study 2, we focused on attempts to decrease unpleasant emotions and measured the intensity of unpleasant emotions by using a unipolar scale (e.g., ranging from *not unpleasant at all* to *very unpleasant*).

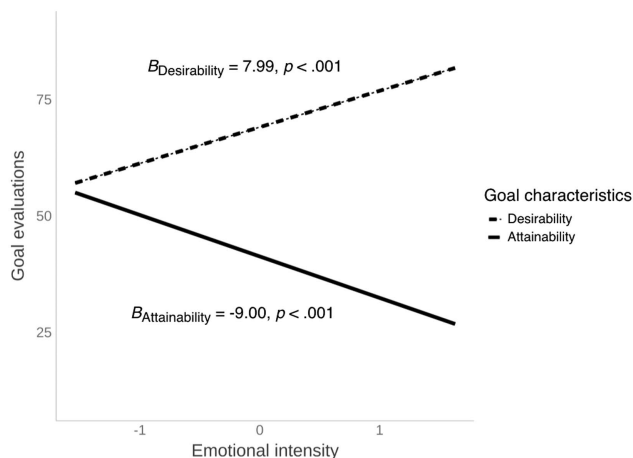
## Study 2

Study 1 provided support for Hypotheses 1–3. Study 2 aimed to examine whether the findings of Study 1 would replicate in daily life (Kuppens et al., 2022), and whether the patterns observed in healthy individuals would differ in those with MDD, who tend to experience difficulties in emotion regulation. In Study 2, therefore, we tested real-world associations between emotional intensity, desirability, and attainability, and effort in emotion regulation. We focused only on efforts to decrease unpleasant emotions, which are most common in daily life (Kalokerinos, Tamir, & Kuppens, 2017). In addition, we tested whether these associations varied between healthy individuals and those diagnosed with current MDD.

To do so, we conducted a 10-day EMA study, with six prompts per day, in both healthy individuals and individuals diagnosed with MDD. In each EMA survey, participants reported on their unpleasant emotional experiences, and on the desirability and attainability of decreasing unpleasant emotions. To assess effort in emotion regulation, we measured both subjective effort (i.e., how much effort people reported investing in decreasing unpleasant emotions) and effort in strategy use (i.e., the overall intensity with which participants implemented multiple emotion regulation strategies to decrease unpleasant emotions).

As preregistered and similar to Study 1, we tested Hypotheses 1–3 and additionally explored differences between healthy and depressed individuals. First, we predicted that the more unpleasant people felt, the more desirable and the less attainable it would be for

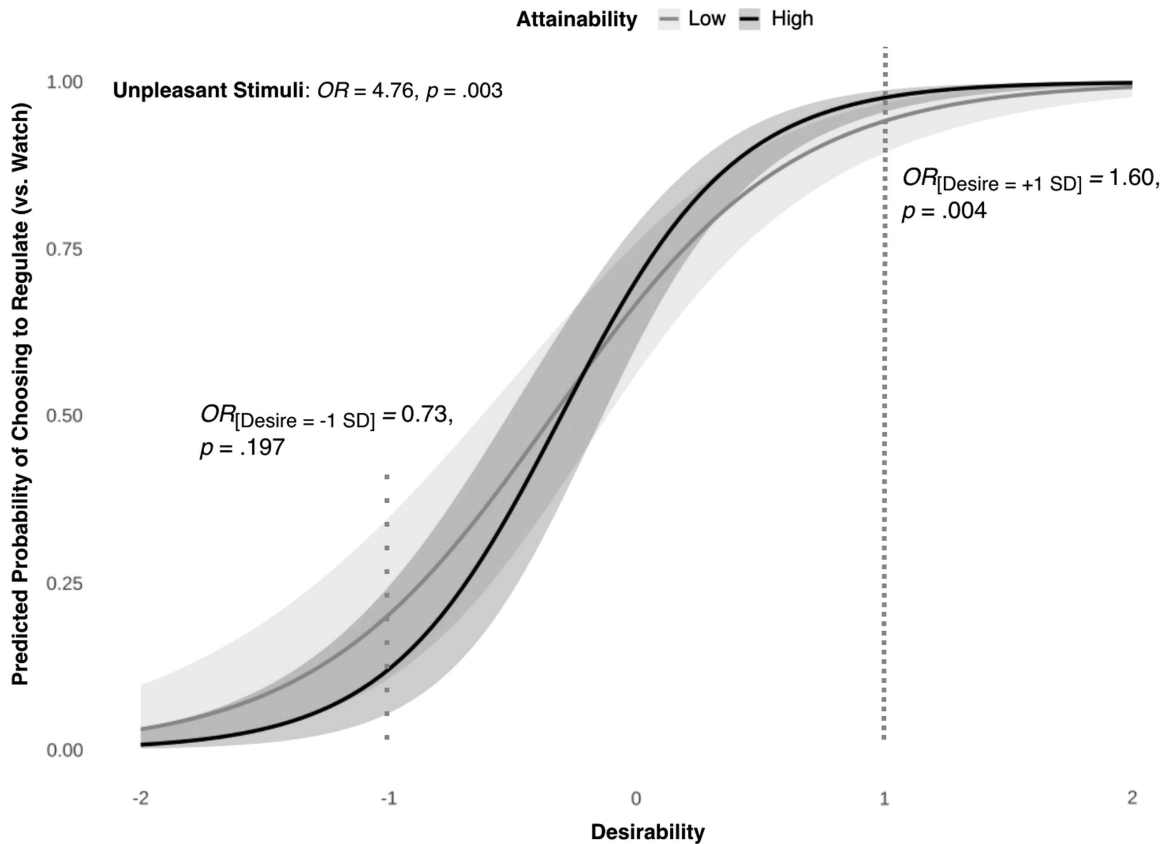
**Figure 2**  
*Desirability and Attainability Varied as a Function of the Intensity of Unpleasant Emotions*



*Note.* The x-axis represents the absolute values of unpleasant emotional intensity (centered), with higher values indicating more intensely unpleasant emotions.

**Figure 3**

*Predicting Effort in Emotion Regulation (i.e., Choosing to Decrease Unpleasant Emotions vs. Not) by Goal Desirability and Attainability*



*Note.* Numbers represent the simple effects of attainability at higher (i.e., +1 *SD* above the mean) and lower (i.e., -1 *SD* below the mean) level of goal desirability. OR = odds ratio; Desire = goal desirability.

them to decrease unpleasant emotions. Second, we predicted that effort in emotion regulation would be independently predicted by desirability and attainability—with desirability being the stronger predictor. Third, we also expected an interactive effect between desirability and attainability on effort—at least among healthy individuals—such that the effect of desirability would be stronger when attainability is higher. Finally, we tested whether the link between unpleasant emotions and desirability or attainability, as well as the associations between desirability and attainability and effort in emotion regulation, would vary between healthy and depressed individuals.

## Method

Study 2 was part of a larger project on daily emotion regulation in healthy and depressed individuals. We describe methodological details relevant to the present investigation.

### Participants

A total of 184 individuals ( $M = 24.28$ ,  $SD = 2.37$ ; 150 females and 34 males) were included in the final sample, which consisted of

94 individuals diagnosed with current MDD and 90 individuals without current or prior psychological disorders (see [Supplemental Materials](#) for demographic and clinical characteristics by group). All participants were Jewish Israelis. We predetermined to recruit at least 120 participants, based on prior data from our lab ( $t = -2.44$ ,  $N = 120$ , 80% power with an  $\alpha$  of .05), using the summary-statistics-based power analysis for multilevel models ([Murayama et al., 2022](#)). We continued collecting data until the end of the academic term, recruiting a total of 189 participants at baseline. No analysis was run before data collection was concluded. In the final data set, participants completed a minimum of three EMA surveys.

### Diagnosis of MDD and Procedure

Recruitment occurred through the university's experiment registration system. Participants needed to meet the criteria for one of two groups as defined by the Diagnostic Interview for Anxiety, Mood, and obsessive-compulsive disorder and related neuropsychiatric disorders ([Tolin et al., 2018](#)). Trained clinical students conducted the diagnostic interviews and among 20% of the interviews selected for reliability assessment, interrater reliability was high: evaluators agreed on 97% of diagnoses,  $k = 0.96$ ,  $p < .001$ .

The MDD group included individuals diagnosed with current MDD. We also excluded participants with bipolar I or II diagnoses or any current or past psychotic symptoms. The healthy controls group included individuals who had never experienced any depressive or other mental disorders.

Participants completed a baseline survey, an EMA study, and a follow-up study. In the EMA study, participants received six surveys daily for 10 days via the application SEMA3 (O'Brien et al., 2024) on their smartphones, which occurred randomly within each 2-hr time window between 10 a.m. and 10 p.m., totaling 60 prompts. Once participants received the prompt, they had 30 min to complete the survey. Participants completed a total of 8,275 EMA surveys. Per the preregistration, we excluded individual EMA surveys in which participants had zero variance in their responses, failed the attention check, or submitted careless responses (completed in less than 60 s), resulting in exclusion of 69 EMA surveys (<1% of all submitted surveys). The final EMA sample involved 8,206 surveys (compliance:  $M = 74.33\%$ ,  $SD = 23.14\%$ ). The MDD group and healthy controls did not differ in compliance rates,  $p = .545$ . Participants were compensated up to \$50.5 or 19 course credits for the EMA study.

## Measures

All EMA measures were reported with reference to the past 2 hr and rated on a scale ranging from 1 = *not at all* to 9 = *very much*.

**Unpleasant Emotional Experiences.** Participants rated the extent to which they felt sadness and anxiety ( $\omega_{\text{between}} = .88$ ,  $\omega_{\text{within}} = .54$ ). These two discrete unpleasant emotions were commonly measured in emotion regulation in depression research (e.g., Millgram et al., 2023).<sup>5</sup>

**Desirability of Decreasing Unpleasant Emotions.** Participants rated the extent to which they wanted to decrease their sadness and anxiety ( $\omega_{\text{between}} = .94$ ,  $\omega_{\text{within}} = .61$ ).

**Attainability of Decreasing Unpleasant Emotions.** Participants rated the extent to which they felt they were able to decrease their sadness and anxiety, separately, if they wanted to ( $\omega_{\text{between}} = .98$ ,  $\omega_{\text{within}} = .69$ ).

**Effort in Emotion Regulation.** We operationalized effort by examining participants' subjective effort and their effort invested in emotion regulation strategy use.

**Subjective Effort.** Participants rated how much effort they invested to decrease their sadness and, separately, how much effort they invested to decrease their anxiety ( $\omega_{\text{between}} = .92$ ,  $\omega_{\text{within}} = .55$ ).

**Effort in Strategy Use.** We also assessed participants' use of eight regulatory strategies that have been highlighted in the Process Model of Emotion Regulation (Gross, 2015) and previously assessed in daily life (e.g., Kalokerinos, Résibois, et al., 2017). Participants indicated the extent to which they used each strategy to decrease their unpleasant emotions. These strategies were presented to participants in a random order and included situation selection ("I tried to choose to do things that would make me feel less bad"), rumination ("I focused on what made me feel bad and thought about it over and over again"), distraction ("I tried to distract my mind away from what made me feel bad and think about other things"), reappraisal ("I changed the way I think about things, so they became less negative"), acceptance ("I tried to accept my negative emotions as they are, without judging them"), expressive suppression ("I avoided expressing my negative emotions"), regulating the body, "I tried to change my bodily sensations (e.g., breaths, heartbeats, sleep)", and

social support-seeking ("I tried to approach someone who would make me feel less bad"). We created a sum score that represented the overall effort invested across strategies to decrease unpleasant emotions ( $\omega_{\text{between}} = .91$ ,  $\omega_{\text{within}} = .60$ ; also see Hu et al., 2026; Kaspi et al., 2025).<sup>6</sup> Given the emerging evidence that putatively ineffective strategies (e.g., rumination, expressive suppression) can sometimes be effective in promoting emotion regulation success and psychological health (e.g., Tamir et al., 2024), we took a conservative approach and operationalized effort in strategy use by including all strategies, including rumination and expressive suppression. Results were similar when we excluded these two strategies.

## Results

Table 2 presents the descriptive statistics and correlations between key variables, for the entire sample and by depression. Consistent with Study 1, desirability and attainability were weakly to moderately correlated, although the direction of these correlations varied by group at the within-person level, suggesting their independence. Similarly, desirability and attainability were related to effort but distinct from it, as their correlations with effort measures ranged from weak to strong at both the within- and between-person levels across healthy and MDD groups.

### Intensity of Unpleasant Emotions and Desirability of Decreasing Them Among Healthy and Depressed Individuals

To account for the nested nature of EMA data (momentary measures at Level 1 nested within participants at Level 2), we used multilevel models to test our hypotheses. In all models described below, Level-1 predictors were person-mean-centered and modeled with random slopes. First, we examined whether the worse people felt in daily life, the more they wanted to decrease their unpleasant emotions (i.e., higher desirability), and if so, whether this association differed between healthy and depressed individuals. We ran a two-way interaction model, with desirability of decreasing unpleasant emotions entered as the outcome, and unpleasant Emotions  $\times$  Depression entered as the predictors. Following the preregistration, to account for preexisting differences in goal desirability, we included desirability measured at the previous assessment as a covariate.

Consistent with Hypothesis 1 and as Table 3 shows, there was a main effect of unpleasant emotions on desirability,  $p < .001$ , indicating that when people experienced more intense unpleasant emotions, they considered decreasing their unpleasant emotions more desirable. This effect, however, was moderated by depression,  $p < .001$ . As Figure 4, Panel A shows, although the intensity of unpleasant emotions was linked to greater desirability in both

<sup>5</sup> Results on sadness (but not anxiety) replicated the composite score patterns. Results on anxiety yielded a similar pattern but did not reach statistical significance. Following the preregistration, we proceeded with the composite scores. Full analyses of each discrete emotion and discussion of them are provided in the Supplemental Materials.

<sup>6</sup> In the final EMA sample, a small proportion of observations involved cases where participants did not rate all strategies (68 out of 8,206 observations, <1%). In the article, we recoded these cases as missing data. However, using alternative approaches—such as computing the mean score of strategy use or using multiple imputations (Austin et al., 2021)—to handle this missing data did not change the results.

**Table 2***Descriptive Statistics and Correlations in the Entire Sample and by Depression in Study 2*

| Variable                  | <i>M</i> | <i>SD</i> <sub>within</sub> | <i>SD</i> <sub>between</sub> | ICC  | 1      | 2      | 3       | 4      | 5      |
|---------------------------|----------|-----------------------------|------------------------------|------|--------|--------|---------|--------|--------|
| <b>Entire sample</b>      |          |                             |                              |      |        |        |         |        |        |
| 1. Unpleasant emotions    | 2.65     | 1.16                        | 1.31                         | 0.51 | —      | .47*** | -.22*** | .24*** | .18*** |
| 2. Desirability           | 3.66     | 1.46                        | 2.06                         | 0.64 | .71*** | —      | -.01    | .39*** | .31*** |
| 3. Attainability          | 3.63     | 1.34                        | 1.74                         | 0.61 | -.20** | .09    | —       | .15*** | .13*** |
| 4. Subjective effort      | 2.55     | 1.16                        | 1.29                         | 0.52 | .64*** | .82*** | .21**   | —      | .48*** |
| 5. Effort in strategy use | 22.33    | 6.79                        | 9.39                         | 0.65 | .73*** | .74*** | .11     | .84*** | —      |
| <b>Healthy</b>            |          |                             |                              |      |        |        |         |        |        |
| 1. Unpleasant emotions    | 1.75     | 0.81                        | 0.70                         | 0.38 | —      | .45*** | -.13*** | .29*** | .33*** |
| 2. Desirability           | 2.61     | 1.28                        | 1.72                         | 0.62 | .55*** | —      | .03*    | .46*** | .41*** |
| 3. Attainability          | 4.15     | 1.39                        | 2.05                         | 0.66 | -.10   | .23*   | —       | .12*** | .07*** |
| 4. Subjective effort      | 2.00     | 0.94                        | 1.15                         | 0.56 | .46*** | .84*** | .29**   | —      | .54*** |
| 5. Effort in strategy use | 17.56    | 6.20                        | 8.23                         | 0.61 | .64*** | .70*** | .22*    | .76*** | —      |
| <b>MDD</b>                |          |                             |                              |      |        |        |         |        |        |
| 1. Unpleasant emotions    | 3.51     | 1.49                        | 1.17                         | 0.35 | —      | .49*** | -.29*** | .22*** | .11*** |
| 2. Desirability           | 4.67     | 1.63                        | 1.84                         | 0.53 | .63*** | —      | -.05**  | .36*** | .24*** |
| 3. Attainability          | 3.12     | 1.29                        | 1.19                         | 0.43 | .11    | .40*** | —       | .18*** | .20*** |
| 4. Subjective effort      | 3.07     | 1.37                        | 1.19                         | 0.40 | .57*** | .69*** | .61***  | —      | .44*** |
| 5. Effort in strategy use | 26.90    | 7.35                        | 8.09                         | 0.53 | .60*** | .60*** | .54***  | .84*** | —      |

*Note.* Correlations below the diagonal are between-person correlations. Correlations above the diagonal are within-person correlations. MDD = major depressive disorder; ICC = intraclass correlation.

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

groups, this association was stronger among healthy individuals,  $B = 0.71$ ,  $SE = 0.05$ ,  $p < .001$ , 95% CI [0.62, 0.81], than among individuals with MDD,  $B = 0.49$ ,  $SE = 0.04$ ,  $p < .001$ , 95% CI [0.42, 0.57]. This interaction qualified a main effect of depression on desirability,  $p < .001$ , such that individuals with MDD considered decreasing unpleasant emotions more desirable than healthy individuals did. Notably, results held when running these analyses without centering the predictors, suggesting that these observed patterns were not driven by differences in the intensity of experienced emotions between both groups, but rather by how emotional intensity translated into perceived desirability.

### **Intensity of Unpleasant Emotions and Attainability of Decreasing Them Among Healthy and Depressed Individuals**

We tested whether the worse people felt, the less attainable it was for them to decrease unpleasant emotions, and if so, whether this association differed between healthy and depressed individuals. To

this end, we repeated the analysis above, with attainability to decrease unpleasant emotions as the outcome and attainability measured at the previous assessment as a covariate. Consistent with Hypothesis 2 and as Table 3 shows, there was a main effect of unpleasant emotions on attainability,  $p < .001$ , showing that the more unpleasant people felt, the less attainable they considered decreasing their unpleasant emotions. This effect was not moderated by depression (see Figure 4, Panel B),  $p = .325$ . However, we did find a main effect of depression on attainability,  $p < .001$ , such that individuals with MDD considered decreasing unpleasant emotions less attainable than healthy individuals did.

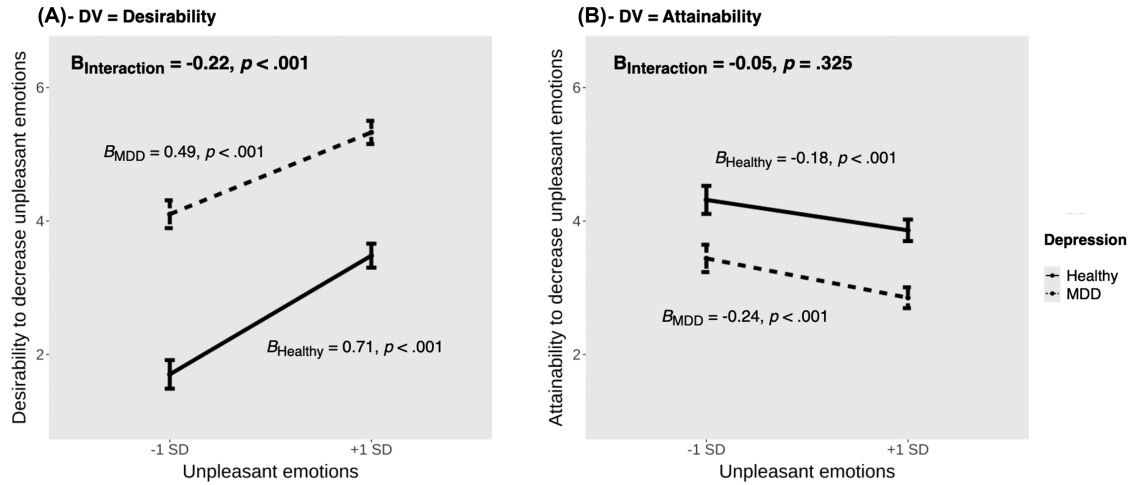
### **Desirability and Attainability as Predictors of Effort in Emotion Regulation Among Healthy and Depressed Individuals**

We tested whether desirability and attainability interacted to predict effort, and if so, whether this interaction differed between

**Table 3***Fixed Effects from Multilevel Models: Desirability and Attainability, Respectively, as a Function of Unpleasant Emotions and Depression*

| Variable                            | Estimate ( <i>SE</i> ) | <i>p</i> | [95% CI]       | <i>R</i> <sup>2</sup> |
|-------------------------------------|------------------------|----------|----------------|-----------------------|
| <b>DV = desirability</b>            |                        |          |                |                       |
| (Intercept)                         | 2.60 (0.19)            | <.001    | [2.23, 2.97]   |                       |
| Depression                          | 2.12 (0.26)            | <.001    | [1.60, 2.64]   | .39                   |
| Unpleasant emotions                 | 0.71 (0.05)            | <.001    | [0.62, 0.81]   | .10                   |
| Desirability <sub><i>t-1</i></sub>  | 0.19 (0.02)            | <.001    | [0.15, 0.22]   | .04                   |
| Unpleasant Emotions × Depression    | -0.22 (0.06)           | <.001    | [-0.34, -0.10] | .01                   |
| <b>DV = attainability</b>           |                        |          |                |                       |
| (Intercept)                         | 4.09 (0.18)            | <.001    | [3.74, 4.44]   |                       |
| Depression                          | -0.94 (0.25)           | <.001    | [-1.44, -0.45] | .11                   |
| Unpleasant emotions                 | -0.18 (0.04)           | <.001    | [-0.27, -0.10] | .01                   |
| Attainability <sub><i>t-1</i></sub> | 0.17 (0.02)            | <.001    | [0.14, 0.21]   | .03                   |
| Unpleasant Emotions × Depression    | -0.05 (0.05)           | .325     | [-0.16, 0.05]  | .00                   |

*Note.* Depression was coded 0 = healthy controls, 1 = MDD. Estimates and *SE* were unstandardized. MDD = major depressive disorder; DV = dependent variable; *SE* = standard error; CI = confidence interval.

**Figure 4***Goal Desirability and Attainability as a Function of Unpleasant Emotions and Depression (Study 2)*

*Note.* Numbers for each group represent results from simple slope analyses. The interaction in Panel B was not significant; simple slopes for this interaction are reported for descriptive purposes only. MDD = major depressive disorder; DV = dependent variable.

healthy and MDD groups. To this end, we ran a three-way interaction model, with each index of effort in emotion regulation serving separately as the outcome, and Desirability  $\times$  Attainability  $\times$  Depression entered as predictors. To understand moment-to-moment changes in effort, we also controlled for effort measured at the previous assessment. Adding this covariate did not change the results. Similar to Study 1, we used the linearHypothesis() function (Fox et al., 2024) to examine whether the effect of desirability differed significantly from that of attainability in predicting effort.

**Subjective Effort.** As shown in Table 4, the three-way interaction between desirability, attainability, and depression was significant,  $p = .002$ . We further examined the interaction between desirability and attainability among healthy and depressed individuals, separately. Consistent with Hypothesis 3a, for both groups, the main effects of desirability and attainability on subjective effort were significant,  $ps < .001$ , such that the more people considered decreasing unpleasant emotions desirable and attainable, the more effort they reported investing to decrease their unpleasant

**Table 4**

*Fixed Effects from Multilevel Models: The Interplay Between Desirability and Attainability on Subjective Effort in Emotion Regulation Among Depressed and Healthy Individuals*

| Variable                                                | Estimate (SE) | <i>p</i> | [95% CI]       | <i>R</i> <sup>2</sup> |
|---------------------------------------------------------|---------------|----------|----------------|-----------------------|
| (Intercept)                                             | 2.00 (0.12)   | <.001    | [1.75, 2.24]   |                       |
| Depression                                              | 1.10 (0.17)   | <.001    | [0.76, 1.43]   | .20                   |
| Desirability                                            | 0.33 (0.03)   | <.001    | [0.28, 0.39]   | .08                   |
| Attainability                                           | 0.08 (0.03)   | .007     | [0.02, 0.14]   | .01                   |
| Subjective effort <sub><i>t-1</i></sub>                 | 0.08 (0.02)   | <.001    | [0.04, 0.11]   | .01                   |
| Desirability $\times$ Depression                        | -0.04 (0.04)  | .250     | [-0.12, 0.03]  | .00                   |
| Attainability $\times$ Depression                       | 0.09 (0.04)   | .024     | [0.01, 0.18]   | .00                   |
| Desirability $\times$ Attainability                     | 0.03 (0.01)   | .003     | [0.01, 0.04]   | .00                   |
| Desirability $\times$ Attainability $\times$ Depression | -0.04 (0.01)  | .002     | [-0.06, -0.01] | .00                   |
| <b>Healthy</b>                                          |               |          |                |                       |
| (Intercept)                                             | 1.97 (0.12)   | <.001    | [1.73, 2.20]   |                       |
| Desirability                                            | 0.34 (0.03)   | <.001    | [0.28, 0.40]   | .24                   |
| Attainability                                           | 0.09 (0.02)   | <.001    | [0.04, 0.13]   | .02                   |
| Subjective effort <sub><i>t-1</i></sub>                 | 0.05 (0.02)   | .056     | [-0.00, 0.09]  | .01                   |
| Desirability $\times$ Attainability                     | 0.03 (0.01)   | <.001    | [0.01, 0.04]   | .00                   |
| <b>MDD</b>                                              |               |          |                |                       |
| (Intercept)                                             | 3.13 (0.13)   | <.001    | [2.88, 3.38]   |                       |
| Desirability                                            | 0.29 (0.02)   | <.001    | [0.24, 0.34]   | .13                   |
| Attainability                                           | 0.18 (0.03)   | <.001    | [0.11, 0.24]   | .04                   |
| Subjective effort <sub><i>t-1</i></sub>                 | 0.10 (0.02)   | <.001    | [0.05, 0.14]   | .01                   |
| Desirability $\times$ Attainability                     | -0.01 (0.01)  | .189     | [-0.03, 0.01]  | .00                   |

*Note.* Depression was coded 0 = healthy controls, 1 = MDD. Estimates and SE were unstandardized. MDD = major depressive disorder; SE = standard error; CI = confidence interval.

emotions. The effect size of desirability ( $R^2 = .24$  in health controls and  $R^2 = .13$  in MDD group) was stronger than that of attainability ( $R^2 = .02$  in health controls and  $R^2 = .04$  in MDD group) in both groups ( $p < .001$  in healthy controls and  $p = .016$  in MDD group), suggesting that although both mattered, desirability was a stronger predictor of subjective effort than attainability was.

Consistent with Hypothesis 3b, we found a significant interaction between desirability and attainability among healthy individuals,  $p < .001$ . As Figure 5, Panel A shows, mirroring the pattern in Study 1, when desirability was lower (i.e.,  $-1$  SD below the mean), the association between attainability and subjective effort was not significant,  $B = 0.05$ ,  $SE = 0.02$ ,  $p = .061$ , 95% CI  $[-0.00, 0.10]$ . However, when desirability was higher (i.e.,  $+1$  SD above the mean), greater attainability was linked to greater subjective effort,  $B = 0.13$ ,  $SE = 0.02$ ,  $p < .001$ , 95% CI  $[0.08, 0.18]$ . Thus, supporting Hypothesis 3b, among healthy individuals, the association between attainability and subjective effort was stronger when attainability was higher. Among individuals with MDD, however, the Desirability  $\times$  Attainability interaction was not significant,  $p = .189$ . As shown in Figure 5, Panel C, the association between desirability and subjective effort did not vary by attainability.

**Effort in Strategy Use.** We observed similar patterns of results when predicting effort in strategy use. First, consistent with Hypothesis 3a, for both groups, the main effects of desirability and attainability on effort in strategy use were significant,  $ps \leq .023$ , such that the more people considered decreasing unpleasant emotions desirable and attainable, the more effort they invested in implementing various emotion regulation strategies. Once again, among healthy controls, the effect size of desirability ( $R^2 = .21$ ) was larger than that of attainability ( $R^2 = .01$ ),  $p < .001$ . However, in the MDD group, the effect sizes of desirability ( $R^2 = .07$ ) and attainability ( $R^2 = .04$ ) were similar,  $p = .731$ . Thus, among healthy controls, but not necessarily among individuals with MDD, desirability was a stronger predictor of effort in strategy use than attainability.

Second, as shown in Table 5, the three-way interaction was significant,  $p = .008$ . We examined the Desirability  $\times$  Attainability interaction among healthy and depressed individuals, separately. As predicted, the interaction between desirability and attainability was significant among healthy individuals,  $p = .030$ . As Figure 5, Panel B shows, when desirability was lower (i.e.,  $-1$  SD below the mean), attainability did not predict effort in strategy use,  $B = 0.11$ ,  $SE = 0.13$ ,  $p = .378$ , 95% CI  $[-0.13, 0.36]$ . However, when desirability was higher (i.e.,  $+1$  SD above the mean), higher attainability was linked to greater effort in strategy use,  $B = 0.39$ ,  $SE = 0.13$ ,  $p = .002$ , 95% CI  $[0.15, 0.64]$ . Among individuals with MDD, there was also a significant interaction between desirability and attainability on effort in strategy use,  $p = .024$ . However, as shown in Figure 5D, the simple effects were the opposite of the predicted pattern. Individuals with MDD invested more effort in strategy use as goal attainability increased, however, they were more likely to do so when desirability was lower (i.e.,  $-1$  SD below the mean),  $B = 1.18$ ,  $SE = 0.16$ ,  $p < .001$ , 95% CI  $[0.87, 1.49]$  rather than higher (i.e.,  $+1$  SD above the mean),  $B = 0.81$ ,  $SE = 0.15$ ,  $p < .001$ , 95% CI  $[0.51, 1.11]$ . These findings suggest that among healthy individuals, attainability of an emotion regulation goal is linked to greater effort invested in strategy use, but only when desirability is higher. However, for individuals with MDD, attainability predicted effort in strategy use more strongly when the goal was less (vs. more) desired.

Importantly, these effects could not be explained by the use of putatively ineffective strategies such as rumination, as excluding them from the measure of effort in strategy use yielded similar results.

## Discussion

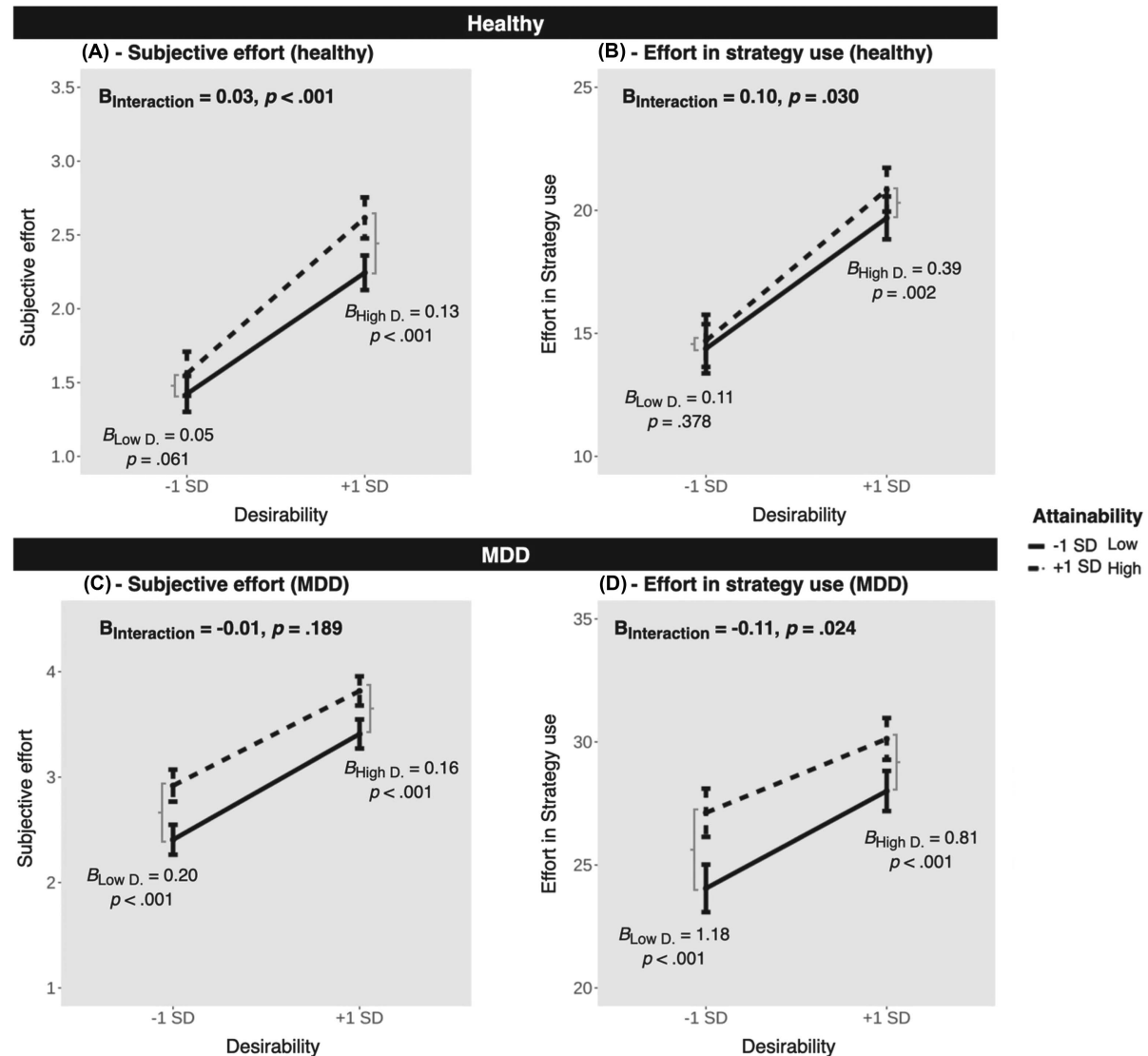
Study 2 extends the findings of Study 1 in several ways. First, replicating Study 1 in a more ecologically valid setting, with two different measures that captured the intensity of effort (rather than merely effortful choice), Study 2 provided further support for Hypotheses 1 and 2, such that as unpleasant emotions became more intense, people considered decreasing unpleasant emotions more desirable, but less attainable. Moreover, although the link between unpleasant emotions and attainability did not vary by depression, depression moderated the link between unpleasant emotions and desirability, such that among depressed (vs. healthy) individuals, goal desirability was less sensitive to the intensity of unpleasant emotions.

Second, with respect to implications for effort investment, supporting Hypotheses 3a and 3b, Study 2 found that among psychologically healthy individuals, effort in emotion regulation varied as a function of both the desirability and attainability of emotion regulation. As in Study 1, among healthy individuals, goal desirability was a stronger predictor of effort than goal attainability. Moreover, goal attainability predicted emotion regulation effort only when goal desirability was relatively higher.

Third, Study 2 showed that patterns that characterized effort in emotion regulation among healthy individuals differed from those among depressed individuals. On the one hand, similar to healthy individuals, those with MDD exerted more effort as their goals in emotion regulation became more desirable and attainable. On the other hand, compared to healthy individuals, goal desirability did not appear to be a stronger predictor of effort than attainability among individuals with MDD, particularly when effort was measured by overall strategy use (in MDD,  $R^2 = .07$  for desirability and  $R^2 = .04$  for attainability). Moreover, unlike healthy individuals who exerted more effort to regulate emotions when doing so was both highly desirable and attainable, individuals with MDD showed a different pattern. They exhibited either no interactive effect of desirability or attainability (subjective effort), or even an inversion (effort in strategy use), such that greater attainability was linked to more effort invested in the service of a less desired emotion regulation goal. These findings suggest that when allocating effort in emotion regulation, depressed individuals might be less sensitive to the possible associations between goal desirability and attainability.

## General Discussion

Emotion regulation can be highly beneficial, yet people often do not engage in it, even when they can (e.g., Daniel et al., 2024). Building on motivational theories, we investigated whether and how key determinants of effortful goal pursuit—goal desirability and attainability—predict effort in emotion regulation, and how these factors are informed by emotional intensity. We tested our hypotheses in both a behavioral task in a controlled experiment with a healthy sample, and in an EMA study of daily life with a healthy and clinical sample, providing both causal and ecologically valid evidence for our research questions.

**Figure 5***Effects of Desirability and Attainability on Effort in Emotion Regulation by Depression*

*Note.* Numbers in black represent results from simple slope analyses. Simple slopes/effects of nonsignificant interaction (Panel C) should be interpreted with caution. MDD = major depressive disorder; D. = desirability.

As hypothesized, in both studies, the intensity of unpleasant emotions predicted higher desirability and lower attainability of the goal of decreasing unpleasant emotions, respectively. That is, the worse people felt, the more they desired to decrease their unpleasant emotions, but the less attainable they considered this goal (i.e., decreasing unpleasant emotions) to be. Second, our findings suggest that although goal desirability is generally a stronger predictor of effort in emotion regulation, attainability also matters. The effects of desirability and attainability, at least among healthy participants, were not independent. Instead, attainability predicted effort in emotion regulation when desirability was higher, but not when it was lower. These patterns were observed in people's decision to engage in effortful emotion regulation during a controlled behavioral task (Study 1), and in people's emotion regulation effort in

daily life (Study 2). Such a pattern is adaptive, in the sense that the greatest cost of exerting effort is "paid" when the benefits are not only desirable, but likely to be realized. Taken together, these findings demonstrate that goal desirability and attainability can jointly shape effort in emotion regulation.

Third, in Study 2, we found that the adaptive adjustment of effort expenditure toward emotion regulation among healthy individuals is different from that observed among individuals with MDD. Although the intensity of unpleasant emotions predicted desirability in both healthy and depressed individuals, this association was weaker in MDD, suggesting that the desire to decrease unpleasant emotions is less strongly linked to how unpleasant they feel in the moment. In addition, whereas attainability only influenced effort in emotion regulation at higher levels of desirability among healthy

**Table 5**

*Fixed Effects from Multilevel Models: The Interplay Between Desirability and Attainability on Effort in Strategy Use Among Depressed and Healthy Individuals*

| Variable                                     | Estimate (SE) | <i>p</i> | [95% CI]       | <i>R</i> <sup>2</sup> |
|----------------------------------------------|---------------|----------|----------------|-----------------------|
| (Intercept)                                  | 17.46 (0.88)  | <.001    | [15.73, 19.18] |                       |
| Depression                                   | 9.84 (1.24)   | <.001    | [7.42, 12.27]  | .38                   |
| Desirability                                 | 1.95 (0.17)   | <.001    | [1.62, 2.28]   | .08                   |
| Attainability                                | 0.22 (0.12)   | .064     | [-0.01, 0.46]  | .00                   |
| Effort in strategy use <sub><i>t-1</i></sub> | 0.19 (0.02)   | <.001    | [0.16, 0.22]   | .04                   |
| Desirability × Depression                    | -0.89 (0.22)  | <.001    | [-1.33, -0.45] | .01                   |
| Attainability × Depression                   | 0.78 (0.17)   | <.001    | [0.45, 1.11]   | .01                   |
| Desirability × Attainability                 | 0.08 (0.05)   | .116     | [-0.02, 0.18]  | .00                   |
| Desirability × Attainability × Depression    | -0.18 (0.07)  | .008     | [-0.32, -0.05] | .00                   |
| <b>Healthy</b>                               |               |          |                |                       |
| (Intercept)                                  | 17.45 (0.90)  | <.001    | [15.70, 19.21] |                       |
| Desirability                                 | 2.09 (0.21)   | <.001    | [1.68, 2.50]   | .21                   |
| Attainability                                | 0.25 (0.11)   | .023     | [0.04, 0.46]   | .01                   |
| Effort in strategy use <sub><i>t-1</i></sub> | 0.15 (0.03)   | <.001    | [0.10, 0.20]   | .03                   |
| Desirability × Attainability                 | 0.10 (0.05)   | .030     | [0.01, 0.20]   | .00                   |
| <b>MDD</b>                                   |               |          |                |                       |
| (Intercept)                                  | 27.34 (0.86)  | <.001    | [25.66, 29.03] |                       |
| Desirability                                 | 1.05 (0.12)   | <.001    | [0.81, 1.30]   | .07                   |
| Attainability                                | 1.00 (0.13)   | <.001    | [0.74, 1.25]   | .04                   |
| Effort in strategy use <sub><i>t-1</i></sub> | 0.22 (0.02)   | <.001    | [0.17, 0.26]   | .05                   |
| Desirability × Attainability                 | -0.11 (0.05)  | .024     | [-0.21, -0.01] | .00                   |

*Note.* Depression was coded 0 = healthy controls, 1 = MDD. Estimates and *SE* were unstandardized. MDD = major depressive disorder; *SE* = standard error; CI = confidence interval.

individuals, this was not true in MDD. Individuals with MDD did invest more effort in emotion regulation when they believed they were more likely to succeed, but this association either did not vary by goal desirability (for subjective effort) or was counterintuitively stronger when goal desirability was lower (for effort in strategy use). Notably, consistent with prior findings (e.g., Hu et al., 2024), overall, depressed individuals invested more effort in emotion regulation than healthy individual. However, these group differences could not be explained by differences in the intensity of experienced unpleasant emotions. Together, these findings point to new ways in which the calibration of effort mobilization might go awry in MDD.

### Implications for Understanding Effort in Emotion Regulation

This investigation builds on prior research that demonstrated that effort in emotion regulation can be informed jointly by the desirability and the attainability of emotion regulation goals (e.g., Gutentag & Tamir, 2022; Gutentag et al., 2024, 2026). However, it extends it in important ways. First, we show that the intensity of unpleasant emotions directly shapes the desirability of prohedonic emotion regulation goals. In nonemotion domains of self-regulation, more intense unpleasant emotions often render a goal less desirable, as they can decrease sensitivity to reward (e.g., Inzlicht et al., 2015). Yet, in emotion regulation, more intense unpleasant emotions render the goal to decrease unpleasant emotions more desirable, because they increase the salience of hedonic needs. This difference highlights the uniqueness of emotion regulation as a form of self-regulation.

Second, we found that intense unpleasant emotions can directly decrease the attainability of prohedonic emotion regulation goals. In any area of self-regulation, emotions can influence the cost–benefit analysis of exerting effort, with unpleasant emotions increasing the

subjective costs of effort (e.g., Grahek et al., 2020). This effect may be particularly pronounced in emotion regulation, where more intense unpleasant emotions also render the regulation task more difficult, thereby further decreasing goal attainability.

Third, among healthy people, we found that both goal desirability and attainability independently predicted effortful emotion regulation, but goal desirability was a stronger predictor. In Study 1, when participants were exposed to stimuli that varied both in valence and intensity, goal desirability, but not attainability, predicted the decision to engage in emotion regulation (see Supplementary Materials). This might have happened because the desirability of decreasing pleasant emotions was too low for attainability to drive effortful goal pursuit (Kruglanski et al., 2014). In Study 2, when focusing only on decreasing unpleasant emotions, both desirability and attainability predicted effort in emotion regulation.

Finally, we demonstrate that, at least among healthy participants, desirability and attainability of emotion regulation goals interact to predict effort in emotion regulation. Attainability was unrelated to effort when desirability was lower, but it was positively related to effort when desirability was higher. That is, attainability helps people mobilize resources toward the goal that they desire, but ultimately, it is the desire that drives effortful behavior. Together, these results provide empirical support for the predictions of the motivational readiness model (Kruglanski et al., 2014) in the context of emotion regulation, highlighting the importance of understanding emotion regulation from a motivational perspective.

### Implications for Understanding Effort in Emotion Regulation in Depression

By comparing predictors of effort in emotion regulation among MDD and healthy individuals, our data uncover unique patterns of

unhealthy emotion regulation. First, at the mean level, as might be expected, individuals with MDD (vs. healthy individuals) reported higher desirability of emotion regulation goals, lower perceived attainability of these goals, and greater effort investment in emotion regulation. These findings are in line with prior research showing that individuals with MDD may be more motivated to engage in emotion regulation than healthy individuals (e.g., Hu et al., 2024) and may engage in emotion regulation more frequently (Liu et al., 2023), but they tend to have lower self-efficacy in emotion regulation (e.g., Bardeen & Fergus, 2020).

Second, when evaluating the desirability of emotion regulation goals, individuals with MDD (vs. healthy individuals) were less sensitive to the intensity of their unpleasant emotions, showing a stronger desire to engage in emotion regulation, even when their emotions were relatively less intense. This finding suggests that depressed individuals may be less attuned to the intensity of their unpleasant emotions or less able to use these experiences as feedback during goal pursuit. This finding aligns with prior research showing that depressed individuals are motivated to regulate their emotions even when it is not necessary (Hu et al., 2024). These findings also point to the possibility that clinically depressed and healthy individuals may evaluate their emotion regulation goals in different ways. It is possible that emotion intensity carries less weight in predicting goal desirability among depressed (vs. healthy) individuals because other factors are at play. For instance, clinically depressed individuals often endorse competing goals in emotion regulation, such as wanting to increase their unpleasant and pleasant emotions at the same time (e.g., Liu et al., 2023). This conflict may deprioritize the goal of decreasing unpleasant emotions when they simultaneously seek to maintain or even increase those emotions.

Whereas the link between unpleasant emotions and desirability of emotion regulation goals was moderated by depression, the link between unpleasant emotions and attainability was not. Given that depressed individuals have low self-efficacy in emotion regulation (e.g., Bardeen & Fergus, 2020) and consider emotions less amenable to control (e.g., Kneeland et al., 2016), it is not surprising that individuals with MDD generally perceived decreasing unpleasant emotions as less attainable compared to healthy individuals, even after accounting for group differences in emotional intensity. This may be because emotion regulation is objectively more challenging (i.e., less attainable) in MDD, potentially because depressed individuals are less skilled at emotion regulation (Visted et al., 2018).

Third, although both goal desirability and attainability predicted effort in emotion regulation in MDD, depressed individuals did not calibrate their effort investment in the same way as healthy individuals did. Whereas desirability was a stronger predictor of emotion regulation effort than attainability among healthy participants, both factors were equally influential among depressed participants. Thus, in MDD, the calibration of emotion regulation effort appears less aligned with motivational priorities (i.e., goal desirability). Moreover, healthy participants were most likely to invest effort to achieve attainable emotion regulation goals, when desirability was higher. In contrast, participants diagnosed with MDD invested more effort to pursue attainable emotion regulation goals regardless of how desirable they were—or were even more likely to do so when the goals were less desired.

These findings suggest that depressed individuals are less likely to tailor their emotion regulation effort to momentary needs—potentially investing less effort when they need to invest more or

investing more effort when they need to invest less. These findings align with prior research suggesting that individuals with MDD may have a diminished capacity to engage with their desires—a core characteristic of the disorder (e.g., Rømer Thomsen et al., 2015). One explanation of these patterns in MDD is that depressed individuals might lack self-insight about their desire, leading them to direct resources toward a wide range of goals, rather than those they desire the most (e.g., Nakajima et al., 2018). An alternative possibility is that desirability and attainability are not completely independent, and their interdependence is different in depression. Goal desirability and attainability are often positively correlated (e.g., Trautwein et al., 2012), justifying the assisting role of attainability to augment the effects of desirability. However, among individuals with MDD, highly desired goals may also be perceived as less attainable. As a result, attainability may not necessarily serve to enhance the impact of desirability. In line with this possibility, in Study 2, at the within-person level, desirability and attainability were positively correlated among healthy individuals, but negatively correlated in MDD. To summarize, whereas healthy individuals optimize their resource allocation in emotion regulation by working harder when it is desirable and justified, resource mobilization may be less efficient in MDD, as depressed individuals are less likely to align what they can do (attainability) with what they want to do (desirability).

## Limitations and Future Directions

In two studies, using different designs, measures, and samples, we found converging support for our preregistered hypotheses. Nonetheless, this research had some limitations. First, evidence from Study 2 is correlational. Although we manipulated emotional intensity as a means to influence desirability and attainability in Study 1, it is unclear whether the effects of desirability and attainability on effort in emotion regulation were causal. Moreover, we examined desirability and attainability as antecedents of effort in emotion regulation. However, it is possible that effort invested shapes the value assigned to goals in emotion regulation (Inzlicht et al., 2018), thereby altering how people perceive the desirability and attainability of these goals. Future research should test the causal and potentially reciprocal association between goal desirability, goal attainability and effort, including in clinical samples.

Second, although we used three different operationalizations of effort, future research could incorporate additional measures, such as physiological indicators like heart rate and pupil dilation (Scheffel et al., 2021). Relatedly, in both studies, measures of goal desirability and attainability preceded measures of effort. Such priming might have influenced how people made effortful choice or reported their effort investment. Future studies should consider measuring effort in emotion regulation without priming goals. Moreover, whereas Study 1 measured attainability prior to the implementation of regulation, Study 2 measured attainability and effort retrospectively (i.e., in the past 2 hr). Consequently, reports of attainability may have been biased by the actual success (or failure) of the specific regulation attempt. Future research should measure attainability as the *anticipated* likelihood of success in goal pursuit.

Finally, this investigation focused on goal desirability and attainability as key determinants of effortful goal pursuit. However, other factors—such as goal clarity (Locke & Latham, 2019)—may also influence effort in emotion regulation. Future research should

explore additional predictors of effort in emotion regulation. This research has also primarily focused on efforts to decrease unpleasant emotions. Although this is the most common form of controlled emotion regulation in daily life, future research should investigate whether the present findings apply to other forms of emotion regulation. Relatedly, emotion regulation can be either controlled or automatic (Mauss et al., 2007; Williams et al., 2009; Yuan et al., 2015). Although controlled processes are typically assumed to be effortful, and automatic processes are not, little is known about whether this distinction applies to emotion regulation. Future research could examine whether some forms of automatic emotion regulation may nevertheless require some degree of effort—and, if so, which factors predict effort in automatic emotion regulation.

### Constraints on Generalizability

This research was limited to young adult Israeli Jewish student samples, and the samples in both studies were predominantly female. Therefore, the findings may not be generalizable to other age/gender groups or countries. Future research could attempt to replicate the present findings with more diverse samples that are equivalent in key demographic characteristics.

### Conclusions

Understanding when people are willing to invest effort in emotion regulation is important. This investigation focuses on two fundamental determinants of effort: the desirability and attainability of emotion regulation goals. First, more intense unpleasant emotions render the emotion regulation goal of decreasing unpleasant emotions more desirable but less attainable. Second, goal desirability and attainability independently and interactively predict effort in emotion regulation. Third, whereas these motivational processes characterize calibration of emotion regulation effort among healthy individuals, these are less characteristic of individuals who are clinically depressed. Thus, depressed individuals may not necessarily strive to optimize their resource allocation in emotion regulation.

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