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RESEARCH ARTICLE

Putting Effort into Emotion Regulation: Manipulating Desirability and Motivational Strength

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Abstract
Although people often want to regulate their emotions, they are sometimes reluctant to invest the necessary effort in doing so. We propose that people could be motivated to invest effort in emotion regulation, by rendering the target emotional state more desirable. Rendering an emotion goal more desirable can motivate people to invest effort in emotion regulation, ultimately facilitating successful emotion regulation. In three studies (N = 452), we show that both inside and outside the lab, rendering calmness more desirable, boosted the motivational strength to increase calmness, increasing the effort people invested to increase calmness, and ultimately made people calmer. This investigation points to the importance of motivational strength as a potential means to promote effort and success in emotion regulation.

Keywords Motivation · Emotion · Emotion regulation · Effort

Success in emotion regulation is important for adaptive functioning (e.g., Gross et al., 2019); yet, people are often reluctant to invest the necessary effort for regulating emotions. How can we motivate people to invest effort in emotion regulation? We propose that to engage and succeed in emotion regulation people must be sufficiently motivated to do so, and that the strength of their motivation is informed by the desirability of their target emotional state.

Motivational Strength in Emotion Regulation

The motivational literature distinguishes between content and strength of motivation (e.g., Atkinson, 1954; Gollwitzer, 1990). Motivational content refers to what goal people pursue, whereas motivational strength refers to the intensity with which that goal is pursued. For instance, two people may be motivated to lose weight (i.e., share motivational content), but differ in how intensely they pursue that goal (i.e., differ in motivational strength). The person who is more strongly motivated to lose weight is likely to invest more effort and may ultimately lose more weight. Here, we examine motivational content and strength in emotion regulation.

Emotion regulation involves pursuing a goal to influence the emotion trajectory (Gross et al., 2011). According to the extended process model (Gross, 2015), emotion regulation begins with an identification stage, that is completed with the activation of a goal to regulate emotions (Gross, 2015). The model highlights the critical role of motivation in emotion regulation, but it focuses specifically on motivational content (i.e., what people want to feel). Motivational content in emotion regulation determines the direction of regulation (Tamir, 2016). We suggest, however, that motivational strength in emotion regulation (i.e., how strongly motivated people are to feel what they want to feel) is similarly critical for success. This is because emotion regulation often requires effortful control (e.g., Gyurak et al., 2011), which is costly (e.g., Shenhav et al., 2017). People are less likely to try to regulate their emotions, the more effortful they expect it to be (Milyavsky et al., 2018; Sheppes et al., 2014). Boosting motivational strength may entice people to engage in emotion regulation, even when it is effortful.

What might boost motivational strength in emotion regulation? First, people may be more motivated to regulate

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emotions when externally instructed to do so (Webb et al., 2012). However, intrinsic motivation plays a larger role than extrinsic motivation when people choose freely how much effort to invest in emotion regulation (Benita, 2020). Second, people may be more motivated to regulate emotions when they have the appropriate means to do so. For example, cognitive reappraisal training increased the likelihood that people engage in emotion regulation (e.g., Ranney et al., 2017). However, teaching people how to regulate may not be sufficient to get them to regulate. For instance, depressed people are able to implement cognitive reappraisal in the laboratory (Liu & Thompson, 2017), but fail to use it in daily life (Yoon & Rottenberg, 2020). A third alternative, therefore, is that people may be more motivated to regulate emotions, when they find the emotion goal sufficiently desirable.

Motivational strength depends on goal desirability (e.g., Hollenbeck & Klein, 1987; Kruglanski et al., 2002). People are more motivated to regulate, the more attractive the target goal (Oettingen et al., 2009). The more motivated people are to pursue a goal, the more effort they invest to pursue it (e.g., Gollwitzer, 1990; Locke & Latham, 2015). Whereas motivational strength refers to the potential for goal-directed action, effort refers to the intensity of the action itself (Inzlicht et al., 2018). Desirability of goals, however, does not always result in greater effort in goal pursuit. First, even when a goal is desirable, people might revert to habitual behavior (Neal et al., 2011). Second, they may not exert effort if they do not have available means (Kruglanski et al., 2018). Third, they may not exert effect, unless the desirable features of emotion are sufficiently salient (Kruglanski et al., 2015).

The desirability of emotion goals depends on their hedonic and instrumental value (Tamir, 2016). Hedonic value is salient. Indeed, people are more likely to regulate their emotions to feel good (Kalokerinos et al., 2017). However, people do not always engage in emotion regulation even when they expect to consequently feel better (Suri et al., 2015). Alternatively, increasing the desirability of emotion goals by rendering their instrumental value more salient can change motivational content in emotion regulation (e.g., Tamir et al., 2015). For example, participants tried to increase anger before a negotiation, but only when they expected to gain financially from good performance (Tamir et al., 2013). Here, we tested whether rendering an emotion goal more desirable by highlighting its instrumental value could also boost motivational strength, increasing effort, and ultimately success in emotion regulation.

The Present Studies

In three studies, we manipulated the desirability of calmness, and tested effects on motivational strength, effort, and success in increasing calmness. Studies 1a–b were lab studies, and Study 2 was conducted outside the lab and over an extended period of time. To manipulate the desirability of calmness, we adapted a validated manipulation (e.g., Chiu et al., 1997), where participants read bogus articles, highlighting the high instrumental value of calmness (Studies 1a–b, and 2), compared to low instrumental value (Study 1a), to a neutral control (Study 1b), and to high instrumental value of excitement (Study 2). We assessed effects on calmness and excitement, expecting such effects to be inversely related, as calmness is low and excitement is high on arousal (Russell, 1980). To assess motivational strength, we assessed self-reported commitment and willingness to invest effort. We also assessed persistence directly in Study 1b and indirectly in Study 2. Compared to control conditions, we expected participants in the high desirability of calmness condition to be more strongly motivated to increase calmness.

To assess effort in emotion regulation, we used three behavioral indices. First, in Studies 1a–b, we used a measure derived from an effortful regulation paradigm used with animals (e.g., Everitt & Robbins, 2005) and humans (e.g., Hahn et al., 2015). Participants could either increase or decrease exposure to emotion-inducing images, by repeatedly pressing designated keys on their keyboard. This procedure allowed us to identify the direction of regulation (reflecting motivational content), as well as quantify the degree of effort invested (motivational strength; Kim et al., 2010). We expected participants in the high desirability of calmness condition to invest more effort in regulating calmness, by making more key presses to watch calm (vs. exciting) stimuli. Second, in Studies 1b and 2, participants chose whether to listen to calm or exciting music (motivational content), and indicated how long they wanted to listen to the music (reflecting effort from motivational strength). We predicted that participants in the high desirability of calmness condition would be more likely to choose calm (vs. exciting) music and want to listen to it for longer. Third, in Study 2, participants were presented with twenty 10-s segments of calm (vs. exciting) music, and chose whether to listen to each clip or spend the 10 s in silence. We expected participants in the high desirability of calmness condition to listen to calm (vs. exciting) music for longer, and to ultimately feel calmer.

Studies 1a and 1b

We compared high to low desirability of calmness in Study 1a and high to a neutral control condition in Study 1b. As indices of effort in emotion regulation, we used the effortful regulation paradigm (Studies 1a–b) and the music exposure task (Study 1b). We expected participants in the high desirability of calmness condition to be more motivated to increase calmness, to invest more effort, and ultimately feel calmer.

Method

All studies reported in this manuscript received the approval of the Institutional Review Board of The Hebrew University of Jerusalem, and all participants gave their consent to participate in the studies.

Participants

In Study 1a, the final sample of participants included 106 students (61.3% female; M_{age} = 24.70, *SD* = 3.56). Three additional participants were excluded from the analyses because they were not native Hebrew speakers (a predetermined inclusion criterion), and another participant was excluded because she failed to follow instructions. Participants received approximately $5.50 or one course credit for their participation. In Study 1b, the final sample of participants included 100 students (61.0% female; M_{age} = 23.47, *SD* = 3.32). Thirteen additional participants were omitted for failing to pass reading comprehension checks of the manipulation articles. Participants received approximately $5.50 or one course credit for their participation. Finally, participants who performed exceptionally well on the creativity task earned additional $3.05 bonus in Study 1a (11 participants) and $30.52 in Study 1b (one participant).

Hahn et al. (2015) found an effect size of d = .57 using the effortful regulation task. A power analysis using G*Power 3.0 (Faul et al., 2007) indicated that to detect this effect size at a significance level (α) of .05 with power (1-β) of .80 using an independent samples t-test, a sample size of N = 100 is required.

Materials

Motivational Strength In Study 1a, to assess motivational strength, we averaged across two items. Participants rated the extent (*1*—very little; *7*—very much) to which they were willing to put effort into increasing calmness before the creativity task, and their commitment to increase calmness before the creativity task (α = .68). They completed the same set of items with respect to increasing excitement (α = .75).

In Study 1b, to assess motivational strength, we averaged across three items. Participants rated the extent to which they were willing to invest effort were committed to and were persistent in increasing their calmness before the creativity task (α = .92; *1*—very little; *7*—very much). They completed the same set of items with respect to increasing excitement (α = .93).

Effortful Regulation Paradigm We adapted a behavior paradigm that assesses effortful regulation (e.g., Aharon et al., 2001; Hahn et al., 2015; Strauss et al., 2005). In the paradigm, 20 calming and 20 exciting images were presented in a random order.[1] Each trial was initiated by pressing the spacebar. Then, an image appeared, and participants controlled the duration of the image exposure by repeatedly pressing designated keys on their keyboard. Participants could increase the length of exposure by pressing the "7" and "8" keys, or decrease the length of exposure by pressing the "1" and "2" keys. Each key press increased or decreased the viewing duration by 100ms. The default duration per image was 5 s. Participants were told that the paradigm would last a constant amount of time, regardless of their keypresses, to discourage responses aimed at minimizing the length of the study as a whole. Participants completed a block of six practice trials, presenting images containing a solid color (i.e., blue, red, yellow, purple, green, orange) instead of emotional images. Four scores were computed for this paradigm: the sum of keypresses to increase calming images, the sum of keypresses to decrease calming images, the sum of keypresses to increase exciting images, and the sum of keypresses to decrease exciting images.

Music Exposure Task In Study 1b, participants were told that while the experimenter prepares the creativity task for them, they could listen to music. Following the procedure in Tsai et al. (2007), participants were asked to choose between two music clips. The first was titled "Quiet Waves," described as "calming international music," with a cover depicting a person meditating. The second was titled "Fireworks," described as "high energy international music," with a cover depicting a person jumping in the air. Participants were further asked to indicate how much time they would like to listen to their chosen music (0, 1, 2, or 3 min). Then, participants were instructed to put on the headphones, and listen to their chosen music for 1 min. The calmness and excitement-inducing music clips have previously been validated by Tamir and colleagues (2013): Treefingers and Track 8 by Jah Hannan, respectively.

Emotion Regulation Success In both studies, participants rated their current emotions at the beginning of the experiment and after the effortful regulation paradigm. In Study 1b, participants also rated their emotions after the music exposure task. They rated the extent (*1*—very little; *7*—very much) to which they felt *calm* and *relaxed* (α = .83 and .90, before the manipulation, after the effortful regulation paradigm, respectively, in Study 1a; α = .88, .90 and .94, before the manipulation, after the effortful regulation paradigm, and after the music exposure task in Study 1b). They also rated the extent to which they felt *excited* and *enthusiastic* (α = .83 and .92 in Study 1a; α = .83, .81 and .86 in Study 1b). These items were mixed with several filler items: focused, energetic, and interested.

[1] Pretest of images is reported in the Supplemental Materials.

Procedure

Participants were told that later in the study they will complete a creativity task, and that good performance on the task would be rewarded with a monetary bonus. After rating their emotions, participants were randomly assigned to experimental conditions (high vs. low desirability of calmness in Study 1a; high desirability of calmness vs. neutral control in Study 1b) and underwent the desirability manipulation (inspired by Chiu et al., 1997; Rattan & Dweck, 2010; Schumann et al., 2014; Tamir & Bigman, 2018). The manipulation included a bogus article that participants were asked to read in preparation for the creativity task. In the high desirability of calmness condition in both studies, the bogus article described findings suggesting that calmness promotes creativity. In the low desirability of calmness condition in Study 1a, the article described findings suggesting that calmness impairs creativity. In the neutral control condition in Study 1b, the article described findings suggesting that working in nonprofit organizations promotes creativity (see Supplemental Materials).

As a manipulation check, participants answered several reading comprehension questions and indicated how desirable it would be for them to experience calmness and excitement during the creativity task (*1*—very little; *7*—very much). In Study 1a, participants performed the effortful regulation paradigm, rated their emotions again, and then rated their motivational strength. In Study 1b, participants rated their motivational strength, performed the effortful regulation paradigm, rated their emotions again, performed the music exposure task, and rated their emotions for the third time. The effortful regulation paradigm and the music exposure task were not counterbalanced. To support the cover story, in both studies, participants completed a creativity task (i.e., the standardized Alternative Uses Task; Guilford, 1967). Finally, participants provided demographic information, and were debriefed (see stages of experimental procedure in studies 1a–b, and 2 in temporal sequence in Fig. 1).

Results

See means and standard deviations of key variables in Studies 1a and 1b in Table 1.[2]

Motivational Strength

We ran a repeated-measures ANOVA, with motivational strength as the dependent variable. Emotion (calmness, excitement) was entered as a within-subject factor, and Condition (high vs. low desirability of calmness in Study 1a, high desirability of calmness vs. neutral control in Study 1b) as a between-subjects factor.

In Study 1a, as expected, we found a Condition × Emotion interaction, Wilks' $\Lambda = 0.80$, $F(1,104) = 26.00$, $p < .001$, $\eta_p^2 = .20$. As shown in Fig. 2 and confirmed in follow-up tests of simple effects, motivational strength to increase calmness was higher in the high (vs. low) desirability of calmness condition, $F(1,104) = 24.41$, $p < .001$, $\eta_p^2 = .19$. There was no such difference with respect to motivational strength to increase excitement, $F(1,104) = 2.11$, $p = .150$. This interaction qualified a main effect for Condition, $F(1,104) = 4.07$, $p = .046$, $\eta_p^2 = .04$, such that motivational strength was higher in the high ($M = 4.21$, $SD = 1.21$) than the low ($M = 3.74$, $SD = 1.21$) desirability of calmness condition. The main effect for Emotion was not significant, $F < 0.80$. The Condition × Emotion interaction persisted when controlling for calmness and excitement at baseline ($p < .001$).

In Study 1b, as expected, we found a Condition × Emotion interaction, Wilks' $\Lambda = 0.84$, $F(1, 98) = 18.82$, $p < .001$, $\eta_p^2 = .16$. As shown in Fig. 3 and confirmed in follow-up tests of simple effects, motivational strength to increase calmness was higher in the high desirability of calmness condition compared to the neutral control condition, $F(1, 98) = 17.98$, $p < .001$, $\eta_p^2 = .15$. There was no such difference with respect to motivational strength to increase excitement, $F(1,98) = 0.17$, $p = .680$. This interaction qualified a main effect for Emotion, Wilks' $\Lambda = 0.77$, $F(1,98) = 29.11$, $p < .001$, $\eta_p^2 = .23$, such that calmness ($M = 5.24$, $SD = 0.98$) was higher than excitement ($M = 4.42$, $SD = 1.20$). The main effect for Condition was not significant, $F < 3.70$. The Condition × Emotion interaction persisted when controlling for calmness and excitement at baseline ($p < .001$).

Effortful Regulation Paradigm

We ran a repeated-measures ANOVA, with mean number of keypresses as the dependent variable. Emotion (calmness, excitement) and Direction (keypress to increase and decrease) were entered as within-subject factors, and Condition (high vs. low desirability of calmness in Study 1a, high desirability of calmness vs. neutral control in Study 1b) as a between-subjects factor.

In Study 1a, as predicted, we found a Condition × Emotion × Direction interaction, Wilks' $\Lambda = 0.89$, $F(1,104) = 12.67$, $p = .001$, $\eta_p^2 = .11$. As shown in Fig. 4 and confirmed in follow-up tests of simple effects, in the high desirability of calmness condition, people exerted more effort to increase calmness than excitement, Wilks' $\Lambda = 0.96$, $F(1,104) = 4.62$, $p = .034$, $\eta_p^2 = .04$, and there was no significant difference in effort to decrease calmness and excitement, $F < 1.60$. In the low desirability of calmness condition, people exerted more effort to increase excitement than calmness, Wilks' $\Lambda = 0.95$, $F(1,104) = 5.22$, $p = .024$, $\eta_p^2 = .05$, and to decrease calmness than excitement, Wilks' $\Lambda = 0.88$, $F(1,104) = 14.41$, $p < .001$, $\eta_p^2 = .12$. This interaction qualified a main effect for Direction, Wilks' $\Lambda =$

[2] See manipulation check in the Supplementary Materials.

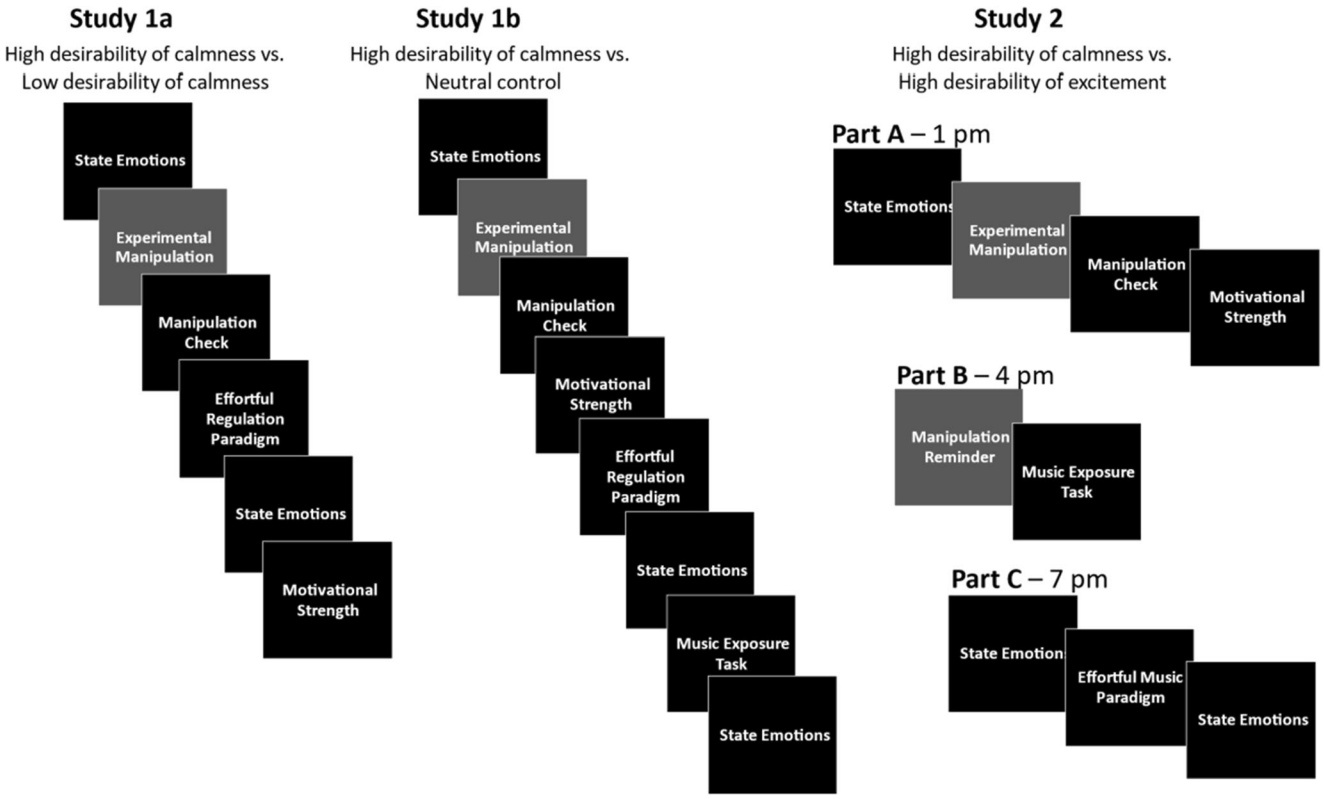

Fig. 1 Stages of experimental procedure in Studies 1a–b, and 2 in temporal sequence

0.95, $F(1,104) = 5.90$, $p = .017$, $\eta_p^2 = .05$, such that participants pressed more to increase ($M = 158.73$, $SD = 200.04$) than to decrease ($M = 104.47$, $SD = 82.84$). No other effect was significant, $Fs < 3.70$. The Condition × Emotion × Direction interaction persisted when controlling for calmness and excitement at baseline ($p = .001$).

In Study 1b, as predicted, we found a Condition × Emotion × Direction interaction, Wilks' $\Lambda = 0.93$, $F(1,98) = 7.85$, $p = .006$, $\eta_p^2 = .07$. As shown in Fig. 5 and confirmed in follow-up tests of simple effects, in the high desirability of calmness condition, participants exerted more effort to increase calmness than to increase excitement, Wilks' $\Lambda =$

Table 1 Means (SD) of key variables by experimental conditions (Studies 1a–b)

	Study 1a ($N = 106$)				Study 1b ($N = 100$)			
Experimental condition	Low desirability of calmness		High desirability of calmness		Neutral control		High desirability of calmness	
Emotion	Calmness	Excitement	Calmness	Excitement	Calmness	Excitement	Calmness	Excitement
Pre-manipulation emotion	4.94 (1.13)	3.38 (1.29)	4.87 (1.2)	3.35 (1.32)	4.87 (1.30)	3.68 (1.39)	4.78 (1.34)	3.67 (1.24)
Desirability	3.43 (1.74)	5.28 (1.47)	5.94 (1.07)	4.42 (1.65)	4.50 (1.67)	4.56 (1.50)	5.78 (1.45)	4.12 (1.76)
Motivational strength to increase	3.19 (1.59)	4.28 (1.72)	4.60 (1.31)	3.83 (1.46)	4.65 (1.44)	4.49 (1.64)	5.83 ((1.33	4.35 (1.74)
Effortful regulation paradigm—keypresses to increases	154.59 (238.70)	203.48 (258.74)	161.87 (190)	114.98 (153.19)	247.06 (286.23)	272.46 (288.53)	212.26 (212.66)	155.78 (142.83)
Effortful regulation paradigm—keypresses to decrease	142.56 (93.75)	105.39 (90.80)	78.75 (84.54)	91.19 (91.69)	89.42 (80.07)	80.08 (77.73)	50.30 (62.53)	64.62 (72.04)
Emotions after the effortful regulation paradigm	4.05 (1.35)	4.27 (1.41)	4.95 (1.24)	3.75 (1.58)	4.93 (1.34)	4.39 (1.42)	5.45 (1.04)	4.37 (1.35)
Emotions after the music exposure task	-	-	-	-	4.99 (1.52)	4.62 (1.25)	5.53 (1.21)	4.25 (1.51)

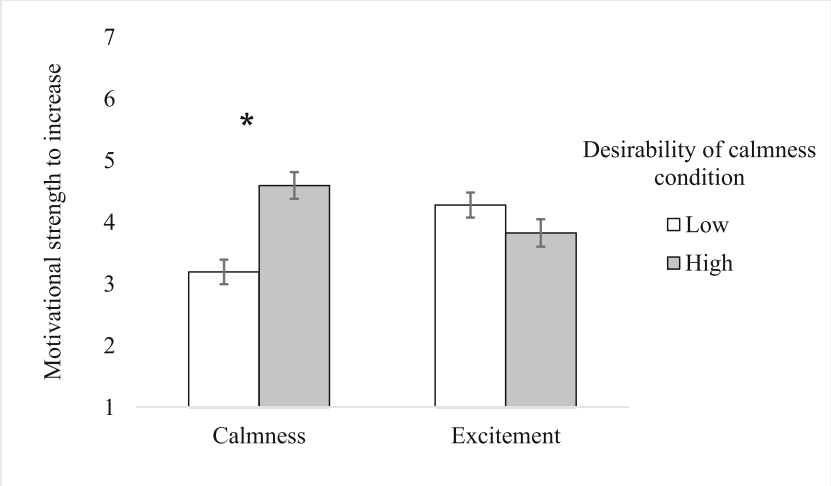

Fig. 2 Motivational strength by emotion and experimental condition (study 1a). Note. * $p < .05$

0.93, $F(1,98) = 6.78$, $p = .011$, $\eta_p^2 = .06$, and there were no differences in effort to decrease calmness and excitement, $F < 3.70$. In the neutral control condition, there were no differences in effort to increase or decrease calmness and excitement, $Fs < 1.60$. This interaction qualified a main effect for Direction, Wilks' $\Lambda = 0.73$, $F(1,98) = 36.54$, $p < .001$, $\eta_p^2 = .27$, such that participants exerted more effort to increase ($M = 221.89$, $SD = 227.63$) than to decrease ($M = 71.10$, $SD = 63.43$). The interaction also qualified a main effect for Condition, $F(1,98) = 5.23$, $p = .024$, $\eta_p^2 = .05$, such that participants exerted more effort overall in the neutral control condition ($M = 172.25$, $SD = 159.33$) than in the high desirability of calmness condition ($M = 120.74$, $SD = 159.33$). We also found an Emotion × Condition interaction, Wilks' $\Lambda = 0.95$, $F(1,98) = 4.92$, $p = .025$, $\eta_p^2 = .05$, such that in the high desirability of calmness condition participants exerted more effort to change calmness ($M = 131.28$, $SD = 173.64$) than excitement ($M = 110.20$, $SD = 157.88$), Wilks' $\Lambda = 0.95$, $F(1,98) = 5.16$, $p = .025$, $\eta_p^2 = .05$. There were no such differences in the neutral control condition, $F < 0.80$. No other effect was significant, $Fs < 1.00$. The Condition × Emotion × Direction interaction persisted when controlling for calmness and excitement at baseline ($p = .007$).

Music Exposure Task

The music exposure task was administered only in Study 1b. There was an effect of condition on music selection, X^2 (1, N=100) = 7.90, $p = .005$, Cramer's $V = .28$, so that in the high desirability of calmness condition, participants preferred calm over exciting music, but this was not the case in the neutral control condition.

To examine whether the desired listening time to the chosen music differed by experimental condition, we conducted an a-parametric two-way Chi-square test, with condition and chosen music as the independent variables, and time (in minutes) as the dependent variable. As expected, we found an

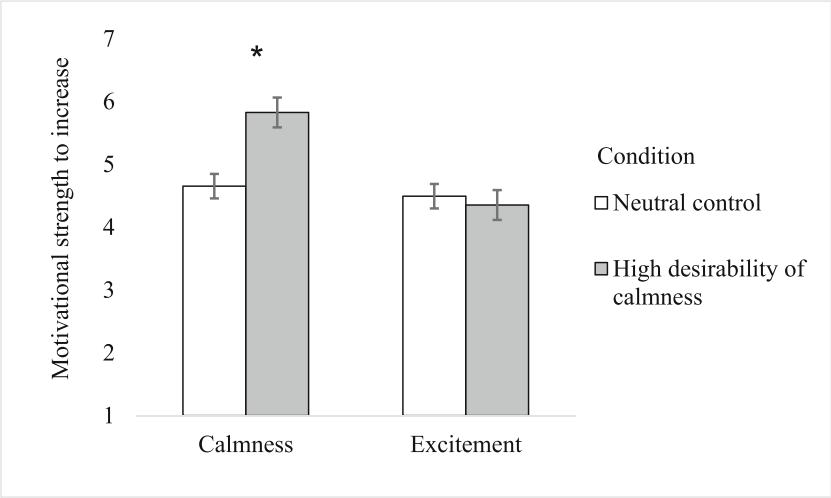

Fig. 3 Motivational strength by emotion and experimental condition (study 1b). Note. * $p < .05$

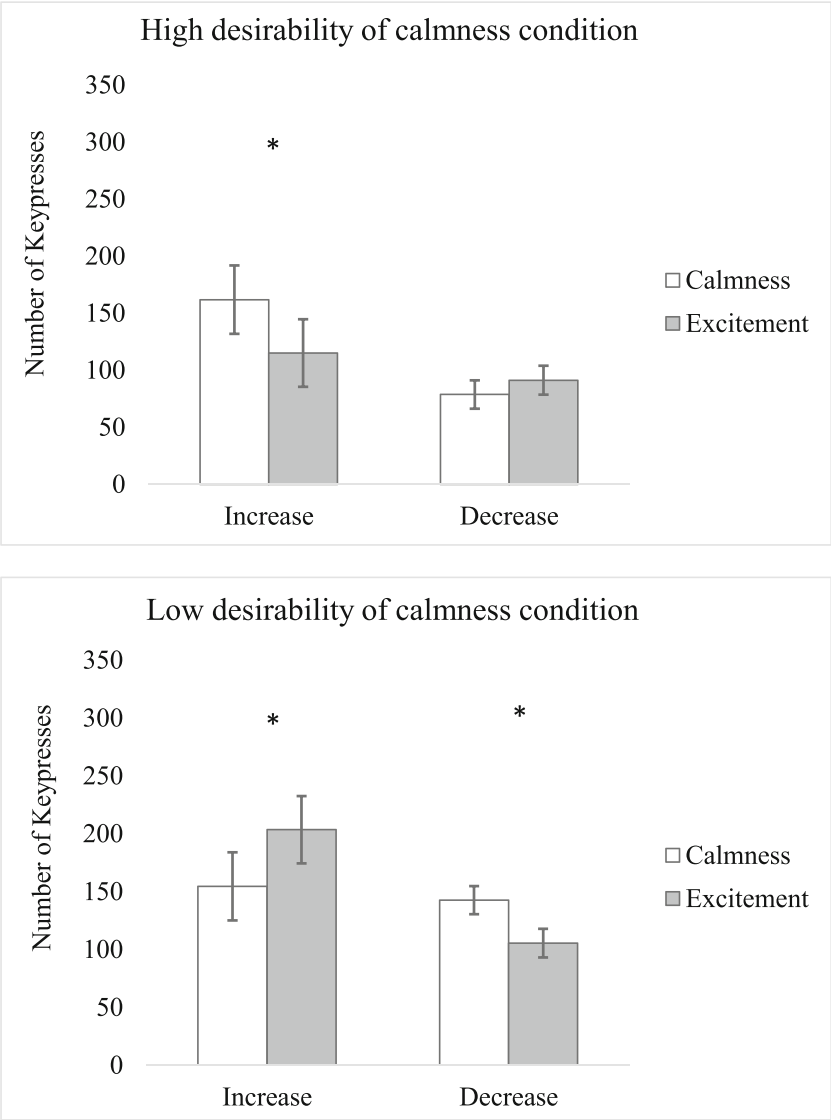

Fig. 4 Effortful regulation paradigm by experimental condition, direction, and emotion (study 1a). Note. * $p < .05$

effect of Condition on Time, χ^2 (3, N=100) = 8.55, p = .036, Cramer's V = .29.[3] Participants in the high desirability of calmness condition wanted to listen to calm music longer than participants in the neutral control condition did, χ^2 (3, N=69) = 9.18, p = .027, Cramer's V = .36. Conditions did not differ in time listening to exciting music, $\chi^2 < 1.70$.

Emotion Regulation Success

We ran a repeated-measures ANOVA, with experienced emotion as the dependent variable. Emotion (calmness, excitement) and Time (before the manipulation, and after the effortful regulation paradigm in Study 1a, before the manipulation, after the effortful regulation paradigm, and after the music exposure task in Study 1b) were entered as within-subject factors, and Condition (high vs. low desirability of calmness in Study 1, high desirability of calmness vs. neutral control in Study 1b) as a between-subjects factor.

In Study 1a, as expected, we found a Time × Emotion × Condition interaction, Wilks' $\Lambda = 0.88$, $F(1,104) = 13.53$, $p < .001$, $\eta_p^2 = .11$. As shown in Fig. 6 and confirmed in follow-up tests of simple effects, before the manipulation there was no difference between conditions in calmness or excitement, $F < 0.20$. After the manipulation, however, people experienced more calmness in the high compared to the low desirability of calmness condition, $F(1,104) = 12.93$, $p < .001$, $\eta_p^2 = .11$, and there was no difference between conditions in excitement, $F < 3.20$. This interaction qualified a main effect for Emotion, Wilks' $\Lambda = 0.64$, $F(1,104) = 58.47$, $p < .001$, $\eta_p^2 = .36$, such that participants experienced more calmness ($M = 4.70$, $SD = 1.07$) than excitement ($M = 3.69$, $SD = 1.21$). It also qualified an Emotion × Condition interaction, Wilks' $\Lambda = 0.94$, $F(1,104) = 6.73$, $p = .011$, $\eta_p^2 = .06$. Participants experienced more calmness than excitement in the high desirability of

[3] Since this was a non-parametric test, we could not control for emotions.

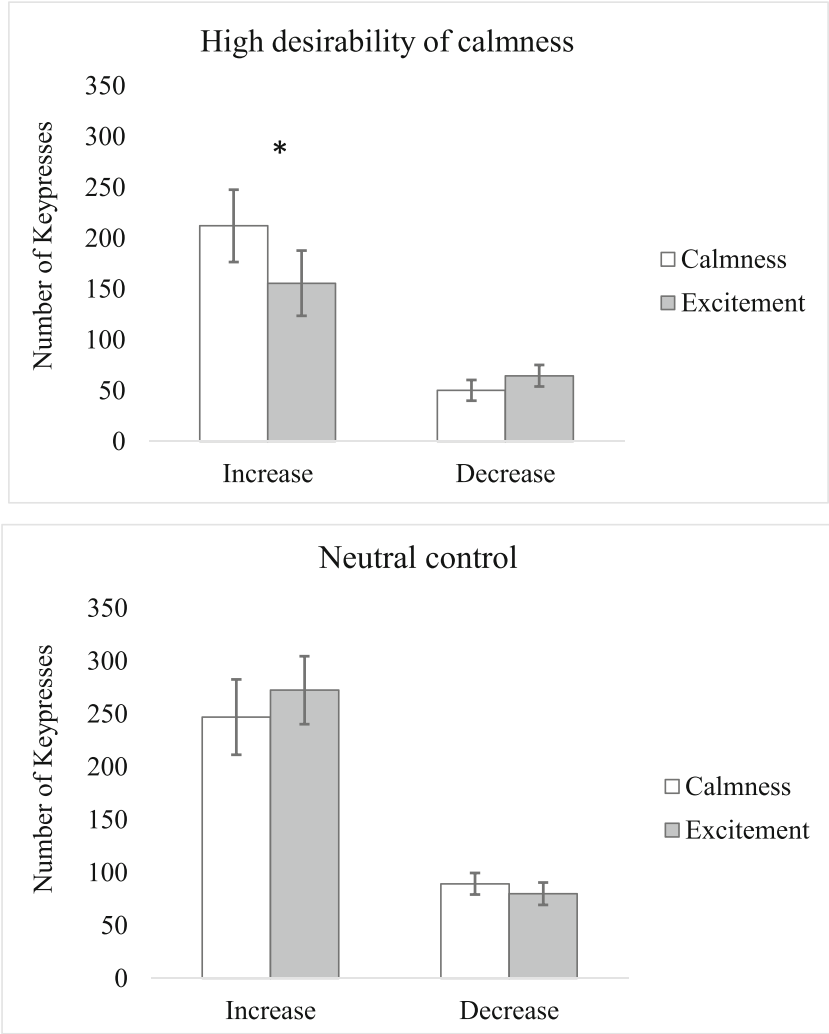

Fig. 5 Effortful regulation paradigm by experimental condition and emotion (Study 1b). Note. * $p < .05$

calmness condition, Wilks' $\Lambda = 0.67$, $F(1,104) = 51.46$, $p < .001$, $\eta_p^2 = .33$, and this was less true of participants in the low desirability of calmness condition, Wilks' $\Lambda = 0.89$, $F(1,104) = 13.01$, $p > .001$, $\eta_p^2 = .11$. We found an Emotion × Time interaction, Wilks' $\Lambda = 0.79$, $F(1,104) = 27.74$, $p < .001$, $\eta_p^2 = .21$, such that participants experienced more calmness than excitement before the manipulation, Wilks' $\Lambda = 0.51$, $F(1,104) = 99.82$, $p < .001$, $\eta_p^2 = .49$, and less so after the manipulation, Wilks' $\Lambda = 0.93$, $F(1,104) = 7.63$, $p = .007$, $\eta_p^2 = .07$. No other effect was significant, $Fs < 2.50$.

In Study 1b, as expected, we found a Condition × Emotion × Time interaction, Wilks' $\Lambda = 0.94$, $F(2,97) = 3.13$, $p = .049$, $\eta_p^2 = .07$. As shown in Fig. 7 and confirmed in follow-up tests of simple effects, before the manipulation, there were no

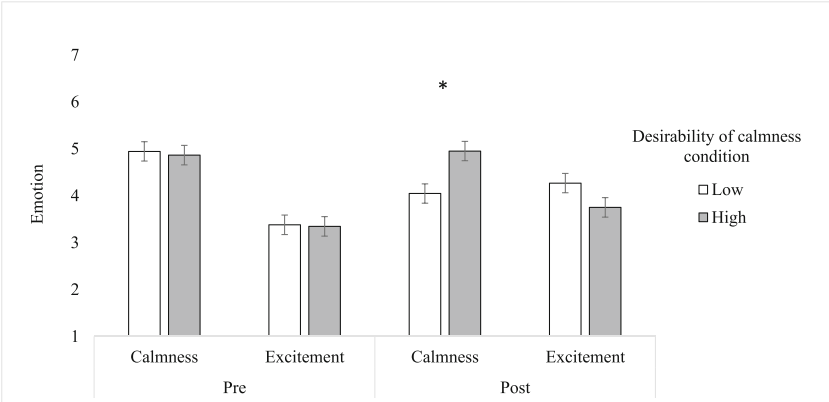

Fig. 6 Pre- and post-manipulation calmness and excitement by experimental condition (Study 1a). Note. * $p < .05$

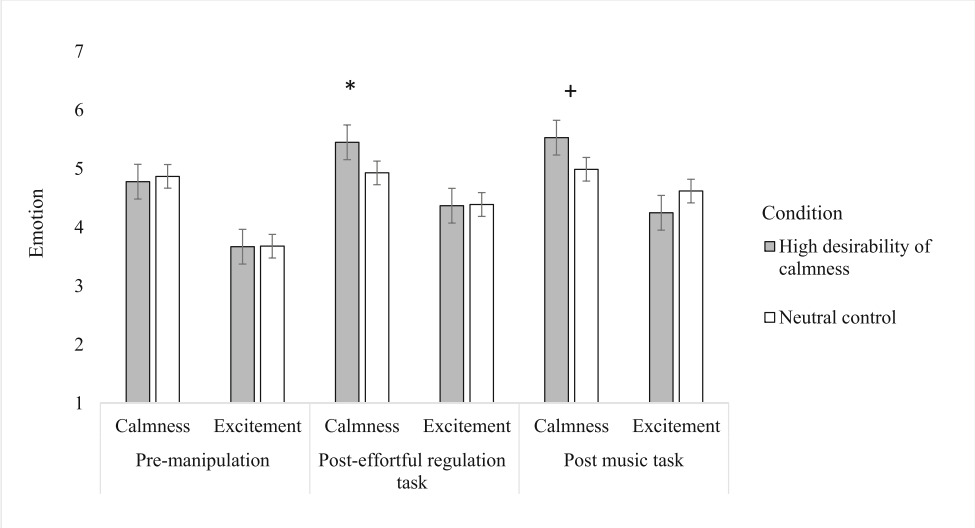

Fig. 7 Pre-manipulation, post effortful regulation paradigm, and post music exposure task calmness and excitement by experimental condition (Study 1b). Note. * $p < .05$; + $p < .10$

differences between conditions in calmness or excitement, $F < 0.20$. After the effortful regulation paradigm, people experienced more calmness in the high desirability of calmness condition than in the neutral control condition, $F(1,98) = 4.71$, $p = .032$, $\eta_p^2 = .05$, and there was no difference between conditions in excitement, $F < 0.10$. This difference remained in the same direction, but was no longer significant after the music exposure task, $F(1,98) = 3.88$, $p = .052$, $\eta_p^2 = .04$. This three-way interaction qualified a main effect for Time, Wilks' $\Lambda = 0.71$, $F(2,97) = 20.07$, $p < .001$, $\eta_p^2 = .29$, such that emotions were less intense before the manipulation ($M = 4.25$, $SD = 1.04$), increased after the effortful regulation paradigm ($M = 4.78$, $SD = 1.08$), and remained at that level after the music exposure task ($M = 4.85$, $SD = 1.14$). We found a main effect for Emotion, Wilks' $\Lambda = 0.61$, $F(1,98) = 61.76$, $p < .001$, $\eta_p^2 = .39$, such that people experienced more calmness ($M = 5.09$, $SD = 1.06$) than excitement ($M = 4.16$, $SD = 1.16$). No other effect was significant, $Fs < 3.80$.

Discussion

As predicted, participants in the high desirability of calmness (vs. control) conditions were more motivated to increase calmness. They invested more effort in increasing calmness, as reflected by more key presses to increase exposure to calm stimuli (Studies 1a–b), and intended to listen to calm music for longer (Study 1b). Effects persisted when controlling for baseline emotions. Finally, participants in the high desirability of calmness condition were ultimately calmer.

Studies 1a–b have several limitations. As brief lab studies, the temporal proximity of the manipulation to the effortful regulation task may have made our predictions salient, creating external demand. Also, we assessed participants' intention to listen to music but not their actual listening behavior.

Study 2

Study 2 was designed to address the limitations of Studies 1a–b, by testing our hypotheses outside the laboratory over an extended timeframe. The study was conducted in three assessments, administered in 1 day, at 1, 4, and 7 p.m. In the first assessment, participants were told about a creativity task they will complete at the end of the day, and underwent the experimental manipulation (high desirability of calmness vs. excitement). As indices of effort, we used the music exposure task (second assessment), and the effortful music paradigm (third assessment). By including several assessments across time, we could compare potential effects of experimental demand (which should be stronger closer to the manipulation) and desirability (which should be stronger closer to the creativity task). We expected participants in the high desirability of calmness (vs. excitement) condition to be more strongly motivated to increase calmness, want to listen to calm music for longer, listen to calm music for longer, and feel calmer. We preregistered these hypotheses (see https://aspredicted.org/vi72b.pdf).

Method

Participants

The final sample included 246 prolific participants (82.5% female; $M_{age} = 38.53$, $SD = 13.91$), who completed the first assessment. Thirty-nine additional participants were excluded from the analyses because they failed the

attention checks. Of the 246, 204 completed the second assessment (82.9%), and 205 completed the third assessment (83.3%). For completing the first part of the study participants received $0.67, for the second part $0.27, and for the third part $0.94. In addition, participants completing all three parts of the study received an additional bonus of $0.50. Finally, participants who performed exceptionally well on the creativity task earned additional $2 bonus.

A power analysis using G*Power 3.0 (Faul et al., 2007) indicated that a sample of 200 was required to detect a small-medium effect size ($f = .20$) in a one-way ANOVA ($1\text{-}\beta = .80$, $\alpha = .05$), with two groups.

Materials

Motivational Strength We assessed motivational strength as in Study 1a (motivational > strength in increasing calmness $\alpha = .94$, and excitement $\alpha = .92$).

Music Exposure Task This task was the same as in Study 1b, with two changes: how much time they would like to listen to their chosen music was assessed on a 0 to 100-s slider, and participants were not asked to listen to their chosen music.

Effortful Music Paradigm Participants were given the opportunity to listen to up to twenty 10-s music segments. These segments were taken from the music clips used in the music exposure task in Study 1b. Participants were presented with ten 10-s segments of the calm music, followed by ten 10-s segments of the exciting music (counterbalancing presentation order). When presented with each music clip, participants could either choose to listen to the music, or not listen to music at all for 10 s. We counted how much time they chose to listen to each music clip (i.e., calmness, excitement), receiving a 0 to 100-s scale.

Emotion Regulation Success Participants rated their current emotions at the beginning of the first part, at the beginning of the third part, and before the creativity task in the third part. They rated the extent (*0*—not at all *emotion*; *100*—very *emotion*) to which they felt *calm* and *relaxed* ($\alpha = .86$, .84 and .91, baseline, pre-effortful music paradigm, and after the effortful music paradigm). They also rated the extent to which they felt *excited* and *enthusiastic* ($\alpha = .79$, .77, and .83). These items were mixed with several filler items: creative, energetic, sleepy, pleasant, and unpleasant.

Procedure

The study included three assessments, administered at 1 p.m., 4 p.m., and 7 p.m. The study was presented as a study on creativity in daily life and the factors that might influence it. In the first assessment, participants were told that at the end of the day they will complete a creativity task, and that good performance on the task would be rewarded with a relatively high monetary bonus. After rating their current emotions and some filler items[4] and providing demographic information, participants were randomly assigned to experimental conditions (high desirability of calmness vs. excitement) and underwent the desirability manipulation. We told participants that to help prepare them, we offer some background information on creativity. The high desirability of calmness condition included the bogus article used in Studies 1a–b. The high desirability of excitement condition included an equivalent bogus article describing findings suggesting that excitement promotes creativity (see Supplemental Materials for the full text). As a manipulation check, participants answered several reading comprehension questions and indicated how desirable it would be for them to experience calmness and excitement during the creativity task (*1*—not at all; *7*—very much). They also reported on the same scale how attainable it would be for them to experience calmness and excitement during the creativity task (*1*—not at all; *7*—very much). Then, they rated their motivational strength in calmness and excitement regulation, as well as their motivational strength in creativity regulation to support the cover story.

In the second assessment, participants were briefly reminded that in a few hours they will complete a creativity task, and that good performance would be financially rewarded. We then offered them to read a brief summary of the background information provided earlier (i.e., the manipulation). In the third assessment, participants rated their current emotions and filler items, completed the effortful music paradigm, rated their current emotions and filler items again, and completed the creativity task used in Studies 1a–b to support the cover story. Finally, participants were debriefed (see stages of experimental procedure in Studies 1a–b, and 2 in temporal sequence in Fig. 1).

Results

Table 2 presents means and standard deviations of key variables in Study 2.[5]

Motivational Strength

We ran a repeated-measures ANOVA, with motivational strength as the dependent variable. Emotion (calmness, excitement) was entered as a within-subject factor and Condition (high desirability of calmness vs. excitement)

[4] Participants also rated how creative, calm, and excited they are in general (*0*—not at all; *100*—very much).

[5] See manipulation check in the Supplementary Materials.

Table 2 Means (SD) of key variables by experimental conditions (Study 2)

Experimental condition	High desirability of calmness		High desirability of excitement	
Emotion	Calmness	Excitement	Calmness	Excitement
Baseline emotion	65.90 (22.12)	47.45 (20.44)	68.06 (19.78)	46.58 (20.37)
Desirability	5.91 (1.05)	3.51 (1.81)	4.19 (1.87)	5.59 (1.31)
Attainability	5.24 (1.13)	4.12 (1.50)	4.66 (1.34)	5.03 (1.42)
Motivational strength to increase	5.83 (1.00)	4.16 (1.70)	4.59 (1.60)	5.55 (1.23)
Music selection[1]	101	8	28	67
Desired listening time	60.12 (29.70)	47.25 (23.42)	52.43 (33.54)	79.24 (23.50)
Emotions pre-effortful music paradigm	70.71 (17.09)	48.27 (17.10)	61.43 (17.42)	59.11 (22.57)
Actual listening time	54.02 (34.72)	23.18 (28.73)	36.45 (32.02)	56.77 (37.60)
Emotions after music effortful paradigm	73.91 (17.46)	45.71 (19.27)	58.66 (20.22)	60.2 (22.39)

[1] Cells contain the number of participants selecting this kind of music

as a between-subjects factor. We found a Condition × Emotion interaction, Wilks' $\Lambda = 0.64$, $F(1,244) = 139.72$, $p < .001$, $\eta_p^2 = .36$. As shown in Fig. 8 and confirmed in follow-up tests of simple effects, motivational strength to increase calmness was higher in the high desirability of calmness (vs. excitement) condition, $F(1,244) = 54.50$, $p < .001$, $\eta_p^2 = .18$. Motivational strength to increase excitement was higher in the high desirability of excitement (vs. calmness) condition, $F(1,244) = 53.26$, $p < .001$, $\eta_p^2 = .18$. This interaction qualified a main effect for Emotion, Wilks' $\Lambda = 0.96$, $F(1,244) = 9.97$, $p = .002$, $\eta_p^2 = .04$, such that motivational strength was higher for calmness ($M = 5.24$, $SD = 1.45$) than for excitement ($M = 4.81$, $SD = 1.65$) in the desirability of calmness condition. The main effect for Condition was not significant, $F < 0.295$. The Condition × Emotion interaction persisted when controlling for baseline calmness and excitement ($p < .001$).

Music Exposure Task

There was an effect of condition on music selection, X^2 (1, N=204) = 87.17, $p = .005$, Cramer's $V = .65$, so that in the high desirability of calmness condition, participants preferred calm over exciting music, and vice versa in the high desirability of excitement condition. To examine whether desired listening time differed by experimental condition, we ran a two-way ANOVA, with time as the dependent variable. Condition (high desirability of calmness vs. excitement) and Music selection (calming vs. exciting music) served as a between-subjects factors. We found a Condition × Music selection interaction, $F(1,200) = 10.69$, $p = .001$, $\eta_p^2 = .05$. As shown in Fig. 9 and confirmed in follow-up tests of simple effects, in the high desirability of excitement condition, listening time was higher for the exciting vs. calming music, $F(1,200) = 17.89$, $p < .001$, $\eta_p^2 = .08$. In the high desirability of calmness condition, contrary to our prediction, there was no difference

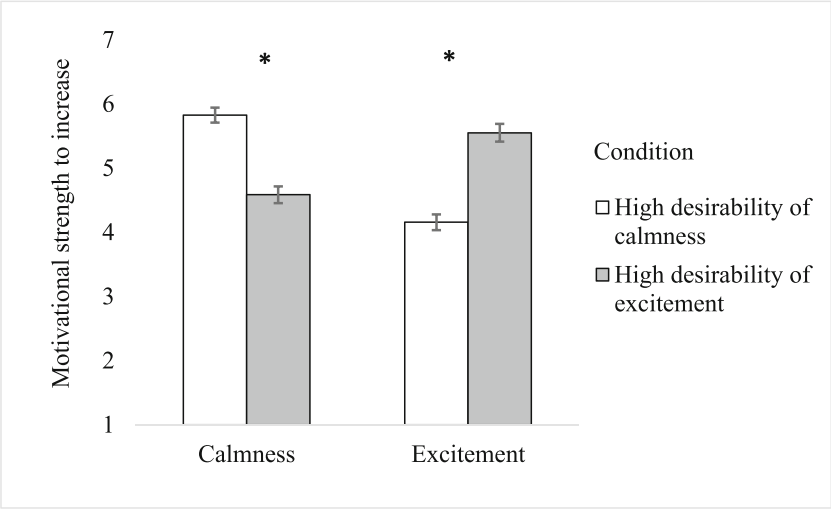

Fig. 8 Motivational strength by emotion and experimental condition (Study 2). Note. * $p < .05$

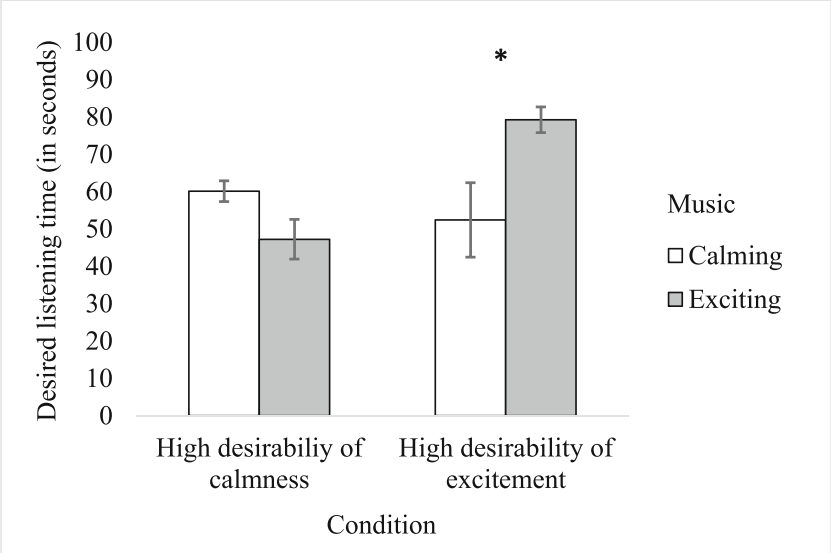

Fig. 9 Desired listening time (in seconds) by experimental condition and music type (study 2). Note. * $p < .05$

in listening time for calming vs. exciting music, $F < 1.55$. This interaction qualified a main effect for Condition, $F(1,200) = 4.01$, $p = .047$, $\eta_p^2 = .02$, such that on average, people preferred to listen to the exciting music for longer ($M = 75.83$, $SD = 25.36$), compared to the calm music ($M = 58.45$, $SD = 30.58$). The main effect for Music selection was not significant, $F < 1.33$. The Condition × Music selection interaction persisted when controlling for baseline calmness and excitement ($p = .013$).

Effortful Music Paradigm

We ran a repeated-measures ANOVA, with time as the dependent variable. Music (calming, existing) was entered as a within-subject factor and Condition (high desirability of calmness vs. excitement) as a between-subjects factor. We found a Condition × Music interaction, Wilks' $\Lambda = 0.72$, $F(1,198) = 76.14$, $p < .001$, $\eta_p^2 = .28$. As shown in Fig. 10 and confirmed in follow-up tests of simple effects, in the high desirability of calmness condition, people actually listened to calm music for longer than they listened to exciting music, Wilks' $\Lambda = 0.77$, $F(1,198) = 59.49$, $p < .001$, $\eta_p^2 = .23$. In the high desirability of excitement condition, people listened to exciting music for longer than they listened to calm music, Wilks' $\Lambda = 0.90$, $F(1,198) = 22.45$, $p < .001$, $\eta_p^2 = .10$. This interaction qualified a main effect for Condition, $F(1,198) = 4.68$, $p = .032$, $\eta_p^2 = .02$, such that total listening time was longer in the high desirability of excitement condition ($M = 4.66$, $SD = 2.61$) than in the high desirability of calmness condition ($M = 3.86$, $SD = 2.62$). The main effect for Music was not significant, $F < 3.22$. The Condition × Music interaction persisted when controlling for baseline calmness and excitement ($p < .001$).

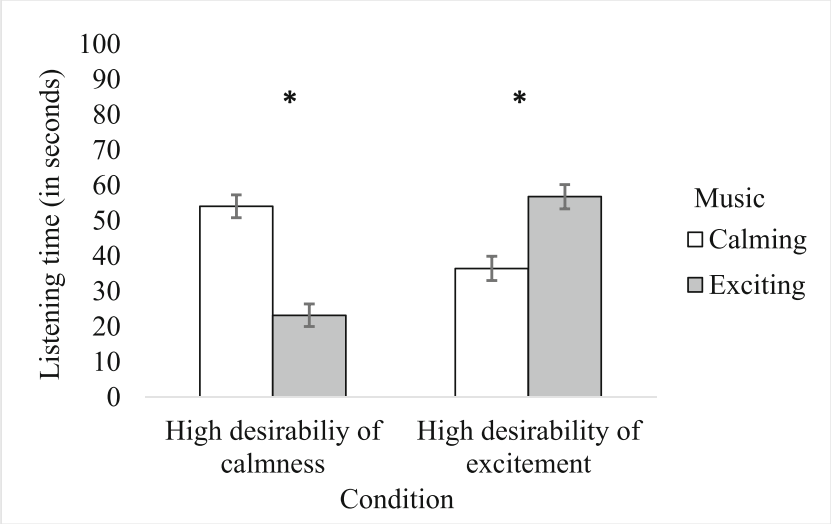

Fig. 10 Actual listening time (in seconds) by experimental condition and music types (study 2). Note. * $p < .05$

Emotion Regulation Success

We ran a repeated-measures ANOVA, with experienced emotion as the dependent variable. Emotion (calmness, excitement) and Time (before the manipulation, pre-effortful music paradigm, and after the effortful music paradigm) were entered as within-subject factors and Condition (high desirability of calmness vs. excitement) as a between-subjects factor. As expected, we found a Condition × Emotion × Time interaction, Wilks' $\Lambda = 0.77$, $F(2,197) = 28.97$, $p < .001$, $\eta_p^2 = .23$. As shown in Fig. 11 and confirmed in follow-up tests of simple effects, at baseline, there were no differences between conditions in calmness or excitement, $F < 1.08$. Before the effortful music paradigm, people experienced more calmness in the high desirability of calmness vs. excitement condition, $F(1,198) = 13.60$, $p < .001$, $\eta_p^2 = .06$. This difference increased, $F[1,198] = 7.17$, $p = .008$, $\eta_p^2 = .03$, after the effortful music paradigm, $F(1,198) = 32.78$, $p < .001$, $\eta_p^2 = .14$. Before the effortful music paradigm, people experienced more excitement in the high desirability of excitement vs. calmness condition, $F(1,198) = 16.47$, $p < .001$, $\eta_p^2 = .08$, a difference that increased but did not reach statistical significance, $F[1,198] = 3.13$, $p = .078$, after the effortful music paradigm, $F(1,198) = 24.18$, $p < .001$, $\eta_p^2 = .11$. When looking at emotions across time, in the high desirability of calmness condition, there was a significant change in calmness across time, $F(2,197) = 5.75$, $p < .001$, $\eta_p^2 = .06$, such that calmness increased from baseline to before the effortful music paradigm ($p = .021$), and from before to after the effortful music paradigm ($p = .022$), whereas excitement didn't change across time ($F < 1.19$). In the high desirability of excitement condition, there was a significant change in excitement across time, $F(2,197) = 14.44$, $p < .001$, $\eta_p^2 = .13$, such that excitement increased from baseline to before the effortful music paradigm ($p < .001$), but did not change from before to after the effortful music paradigm ($p = .663$). There was also a significant change in calmness across time in the high desirability of excitement condition, $F(2,197) = 9.44$, $p < .001$, $\eta_p^2 = .09$, such that calmness increased from baseline to before the effortful music paradigm ($p < .001$), and from before to after the effortful music paradigm ($p = .028$).

This three-way interaction qualified a main effect for Emotion, Wilks' $\Lambda = 0.55$, $F(2,198) = 161.36$, $p < .001$, $\eta_p^2 = .45$, such that calmness ($M = 66.81$, $SD = 15.27$) was higher than excitement ($M = 51.50$, $SD = 16.35$). We found an Emotion × Condition interaction, Wilks' $\Lambda = 0.82$, $F(1,198) = 43.27$, $p < .001$, $\eta_p^2 = .18$. In the high desirability of calmness condition, calmness was higher than excitement, Wilks' $\Lambda = 0.50$, $F(1,198) = 199.86$, $p < .001$, $\eta_p^2 = .50$. In the high desirability of excitement condition, this pattern was also evident, although to a lesser extent, Wilks' $\Lambda = 0.92$, $F(1,198) = 17.53$, $p < .001$, $\eta_p^2 = .08$. We also found a Time × Emotion interaction, Wilks' $\Lambda = 0.93$, $F(2,197) = 7.09$, $p = .001$, $\eta_p^2 = .07$. At baseline, calmness was higher than excitement, Wilks' $\Lambda = 0.54$, $F(1,198) = 169.43$, $p < .001$, $\eta_p^2 = .46$. This patter was also evident before the effortful music paradigm, Wilks' $\Lambda = 0.77$, $F(1,198) = 59.86$, $p < .001$, $\eta_p^2 = .23$, and after it, Wilks' $\Lambda = 0.77$, $F(1,198) = 59.56$, $p < .001$, $\eta_p^2 = .23$. No other effect was significant, $Fs < 2.11$.

Discussion

As preregistered, in the first assessment participants in the high desirability of calmness condition were more motivated to increase their calmness, and in the second assessment preferred calm over exciting music. There was a trend, according to which participants in the high desirability of calmness condition wanted to listen to the calming (vs. exciting) music longer, but contrary to our predictions it did not reach statistical significance. This is perhaps due to the small number of participants who chose the exciting music in this condition (8). When it came to actual listening time in the third assessment, in support of our hypothesis, participants in the high

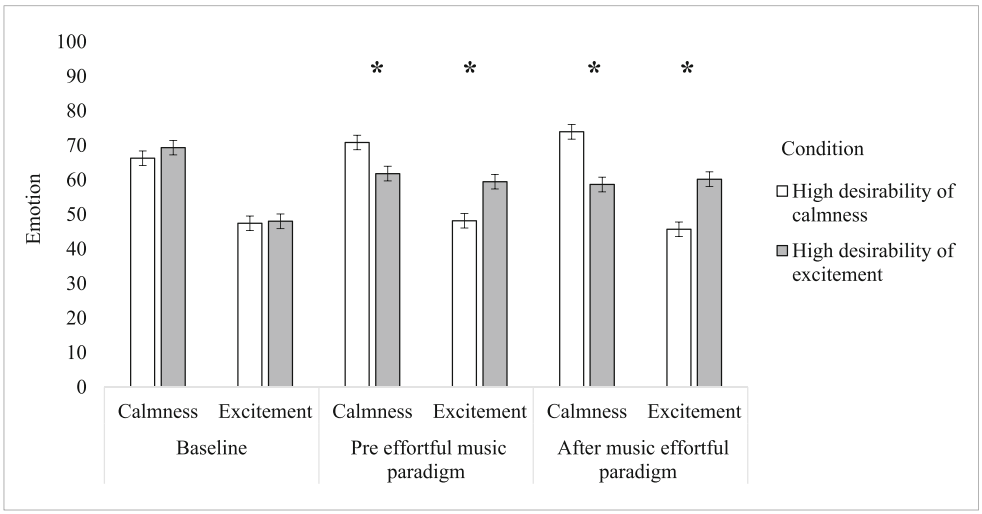

Fig. 11 Baseline, pre-effortful music paradigm, and post effortful music paradigm calmness and excitement by experimental condition (Study 2). *Note.* * $p < .05$

desirability of calmness condition listened to calming (vs. exciting) music longer. These effects remained significant when controlling for baseline emotions. As predicted, in the final assessment, participants in the high desirability of calmness condition were calmer.

General Discussion

How can we encourage people to invest the effort required to regulate emotions? This is critical given that people often choose not to regulate their emotions even when they want and have the means to do so, and even though engaging in emotion regulation can improve their emotional health. In three studies, we found that rendering calmness more desirable, strengthened the motivation to increase calmness, increased the effort invested in increasing calmness, ultimately making people feel calmer.

Theoretical and Applied Implications

Building on research on motivational strength in other domains (e.g., Gollwitzer, 1990), our findings show that the more people consider the target emotion desirable, the more motivated they are to invest effort to achieve it, and the more successful they ultimately are in achieving it. Although research on emotion regulation has typically focused on effects of motivational content (Tamir, 2016), our findings demonstrate the additional and independent contribution of motivational strength. Participants who chose to listen to calm music (i.e., shared similar motivational content) differed in how long they listened to such music (i.e., differed in motivational strength), and such differences ultimately resulted in different levels of calmness. These findings demonstrate that success in emotion regulation depends not only on what people want to feel but also on how strongly motivated they are to feel it.

Our findings extend work on emotion regulation choice (e.g., Matthews et al., 2021; Sheppes, 2020). It is possible, for instance, that motivational strength determines not only how much effort people invest, but also which emotion regulation strategies they select to regulate their emotions. These possibilities could be tested in future research.

From an applied perspective, our findings raise the possibility that deficits in motivational strength may explain why people refrain from regulating their emotions, even when they have the means to do it, both in healthy (e.g., Suri et al., 2015) and clinical (e.g., Liu & Thompson, 2017; Yoon & Rottenberg, 2020) populations. Identifying ways to boost motivational strength in emotion regulation may be important in helping people succeed. For example, designing an intervention aimed at making empathy more desirable to physicians (e.g., stressing the importance of empathy toward patients to treatment success) might boost motivational strength, leading physicians to work harder to be empathetic, and ultimately feel more empathy toward their patients.

Limitations and Future Directions

This research has several limitations. First, might our effects result from demand characteristics? We manipulated the desirability of calmness by providing information regarding its potential utility (see Chiu et al., 1997). Our manipulation did not refer to emotion regulation or to effort, but given its temporal proximity to the dependent measures, participants may have become aware of the link between them. To test whether our effects are driven by experimental demand, in Study 2 we separated our measures across time, allowing us to contrast the effects of demand and desirability. Our second assessment was closer to the manipulation, but further away from the creativity task (lower desirability, higher demand), whereas the third assessment was farther away from the manipulation, but closer to the creativity task (higher desirability, lower demand). If effects are due to demand, they should have been stronger in the second than the third assessment. Our effects were stronger in the third than the second assessments, suggesting that demand per se cannot account for our findings. Future research could try to replicate our findings using even less direct manipulations of desirability (e.g., Tamir et al., 2007).

Second, the generalizability and external validity of our findings awaits further testing. Future studies could examine additional emotion goals and contexts (e.g., daily life), other indirect outcomes (e.g., psychophysiology and nonverbal behavior). Finally, emotions are unique targets for regulation (see Tamir, 2021). There might be cases in which motivational strength may ironically impair rather than facilitate success in emotion regulation. For instance, the more motivated people are to feel happy, the more likely they might be to feel they are not living up to their happiness standards, and the less happy they might feel (Mauss et al., 2011). Future research could examine when motivational strength is (or is not) likely to promote success in emotion regulation, and what might moderate such effects.

Additional Informational

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Conflict of Interest The authors declare no competing interests.

Data Availability All the data reported in the present manuscript are publicly available via Open Science Framework and can be accessed now at: https://osf.io/87wtx/?view_only=d00ca2294bee4a968bf88f58307ea80c. Study 2 was preregistered:https://aspredicted.org/vi72b.pdf.

Code availability Not applicable.

Authors' contributions T.G. and M.T. contributed to the design and implementation of the research, to the analysis of the results, and to the writing of the manuscript.

Ethics Approval All studies reported in this manuscript received the approval of the Institutional Review Board of The Hebrew University of Jerusalem, and all participants gave their consent to participate in the studies.

Consent to participate Not applicable.

Consent for publication Not applicable.

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