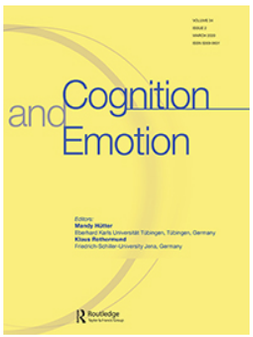

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Emotion regulation choice: a broad examination of external factors

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ABSTRACT

Emotion regulation choices are known to be profoundly consequential across affective, cognitive, and social domains. Prior studies have identified two important external factors of emotion regulation choice: stimulus intensity and reappraisal affordances. However, whether there are other external factors of emotion regulation choice and how these factors contribute to emotion regulation choice when considered simultaneously is not yet clear. The current studies addressed these gaps by examining the relations between emotion regulation choice (distraction vs. reappraisal) and self-reported stimulus intensity, reappraisal affordances, and several other factors including discrete emotions and distraction affordances. Across three studies using different databases of standardised images to enhance generalizability, our results showed that in the context of our experiments, reappraisal affordances were strongly associated with emotion regulation choice (greater reappraisal affordances predicted higher use of reappraisal). Further, stimulus intensity was independently associated with emotion regulation choice in each study. Our results also demonstrated that the discrete emotion of disgust (but not other discrete emotions) is a previously unidentified external factor of emotion regulation choice. We discuss the implications of the current findings.

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Emotion regulation choice; intensity; affordances; discrete emotion

Emotions provide us with adaptive responses for the challenges that we face in everyday life (Lazarus, 1991). While emotions are often helpful, there are times when they are unhelpful. For example, experiencing amusement during a sad conversation with a friend may harm a friendship. Overwhelming anxiety just before an important interview may lead to a poor first impression. However, regulating one's emotions can help mitigate such undesirable outcomes. Emotion regulation is defined as the process by which people influence which emotions they have and how they experience and express these emotions (Gross, 1998).

Although there are various ways to regulate our emotions (Gross, 1998), the present studies focused on two frequently studied regulation strategies – distraction and cognitive reappraisal (Webb, Miles, & Sheeran, 2012). Distraction involves focusing one's attention away from the emotional aspects of a situation (e.g. thinking of baseball while experiencing anxiety in the dentist's office). Cognitive reappraisal (henceforth reappraisal) involves reconstruing the meaning of a situation to alter its emotional impact (e.g. considering the idea that the temporary anxiety of visiting the dentist is a small price to pay for one's long term health).

Our emotion regulation choices have important affective, cognitive, physiological, behavioral, and social consequences (e.g. Butler et al., 2003; Gross, 1998; Gross & John, 2003; Gross & Levenson, 1993; Richards & Gross, 2000). However, particular strategies are not inherently adaptive or maladaptive (Bonanno & Burton, 2013); rather, flexibly deploying them in appropriate contexts determines their adaptiveness (Aldao, 2013; Gross, 2015; Sheppes, Suri, & Gross, 2015). For example, distraction is extremely effective

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at reducing one's negative emotions (Nolen-Hoeksema & Morrow, 1993), but this reduction can come at the cost of poorer memory for emotional stimuli compared to reappraisal (Sheppes & Meiran, 2008). Reappraisal is effective at down regulating negative emotions when initiated prior to an emotional response (Gross & John, 2003; Richards & Gross, 2000), but if initiated late after an emotion response, reappraisal can deplete self-control resources (Sheppes & Meiran, 2008) and lead to greater sympathetic nervous system activation compared to distraction (Sheppes, Catran, & Meiran, 2009).

Prior work on emotion regulation choice

Given the profound consequences of emotion regulation choice, it is pivotal to identify the factors associated with these choices. Prior research has demonstrated that these factors can be internal to the individual (e.g. age, personality) or external to the individual (e.g. stimulus intensity). For example, related to internal factors, those scoring high (vs. low) on trait experiential avoidance report using more distraction (Karekla & Panayiotou, 2011). With respect to reappraisal, use of this regulation strategy tends to increase with age (John & Gross, 2004) and those scoring high (vs. low) on extraversion tend to use reappraisal more often (Gross & John, 2003).

External factors influencing emotion regulation choice are particularly important because they may offer practical opportunities for interventions that seek to alter unhelpful emotion regulation choices. It is now known that stimulus intensity is an important external factor of the choice between distraction and reappraisal (Scheibe, Sheppes, & Staudinger, 2015; Sheppes, Scheibe, Suri, & Gross, 2011; Sheppes et al., 2014; Suri et al., 2018). In a now well-accepted experimental design, Sheppes et al. (2011) used affective images whose normative ratings were categorised as being either low intensity or high intensity. In successive trials, participants (who were blind to these normative categories) were shown an image from this set for 500 ms. They then chose whether they would like to use reappraisal or distraction to regulate their emotions when they viewed the same image a second time for a longer duration (5000 ms). The results showed that participants preferred to use reappraisal over distraction for low intensity images but preferred to use distraction over reappraisal for high intensity images. These choice patterns have been explained by an emotion regulation choice framework that is predicated on the temporal dynamics and the affective consequences of distraction and reappraisal (Sheppes et al., 2014). Specifically, reappraisal is preferred when stimulus intensity is low because in such contexts it is able to provide long-term adaptation through its engagement with and reconstrual of the emotional information. In the context of high intensity stimuli, however, distraction is preferred because, unlike reappraisal, it can effectively inhibit the early onset of intense emotional information (Sheppes & Gross, 2011).

Recent experiments (Suri et al., 2018) have suggested that in addition to intensity, reappraisal affordances, defined as the opportunities for sematic re-interpretation inherent in a stimulus, may be another powerful external factor of emotion regulation choice. Emotional stimuli can have varying levels of reappraisal affordances, even in contexts with equivalent levels of intensity. For example, imagine failing the final exam of a class that you needed to pass to graduate even though you had studied extensively for weeks. Feeling devasted, you attempt to reappraise the situation to downregulate your emotions but generating an effective reappraisal is difficult (i.e. reappraisal affordances are low) because there is no clear justification for the failure and your ability to graduate is now jeopardised. Now, imagine the same situation (you failed the final of a class that you needed to pass to graduate) but you were unable to devote time to studying because of unforeseen personal reasons. While failing the test still devastates you because your graduation status is now uncertain, you're able to more easily generate an effective reappraisal because reappraisals related to the unforeseen circumstances allow you to justify your grade (i.e. this situation has greater reappraisal affordances). Using vignettes designed to provide low or high levels of reappraisal affordances, Suri et al. (2018) found that low levels of self-reported reappraisal affordances were significantly associated with the use of distraction (vs. reappraisal) and high levels of self-reported reappraisal affordances were significantly associated with the use of reappraisal (vs. distraction). These effects were shown to be separate from the effects of intensity. Prior work has also demonstrated the association between reappraisal affordances and emotion regulation choice through examining reappraisal usage as a function of whether participants were provided with a plausible reappraisal to use while viewing negative images (i.e. manipulated reappraisal affordances; Sheppes et al., 2014, Study 2; Suri, Whittaker, & Gross, 2015,

Study 3). In general, participants in these studies tended to choose reappraisal more often when they were given a reappraisal compared to conditions in which a reappraisal was not provided. While these effect sizes were relatively small, prior work was silent as to whether reappraisals generated by the experimenter can be as effective as reappraisals generated by the participant, or whether self-reported reappraisal affordances are empirically related to those that are manipulated.

Gaps in the emotion regulation choice literature

Despite the results of Sheppes and colleagues (2011, 2014, 2015) and Suri et al. (2018) elucidating two external factors of emotion regulation choice—intensity and reappraisal affordances, respectively—two important gaps exist.

First, the list of external factors that influence emotion regulation choice is currently limited to intensity and reappraisal affordances. We believe it is possible that there are many other external factors that might influence emotion regulation choice. For example, although emotion type of the vignettes (anger vs. disgust) did not predict emotion regulation choice in Suri et al. (2018), reappraisal was generally chosen more often among the anger vignettes whereas distraction was more frequently chosen for the disgust vignettes. This suggests that discrete emotions may also influence emotion regulation choice. Another possible factor concerns distraction affordances, which, following our definition of reappraisal affordances, we define as the opportunities for distracting one's attention away that are inherent in a stimulus. Since certain types of stimuli are inherently more salient than others (e.g. positive vs. negative stimuli; Smith, Cacioppo, Larsen, & Chartrand, 2003), it is possible that distraction affordances may vary by stimuli.

Second, it is not known whether reappraisal affordances are related to emotion regulation choice in contexts other than emotional vignettes (e.g. images). Relatedly, the relative contributions of intensity and reappraisal affordances in determining choice (when considered simultaneously) are only weakly understood because most studies have studied them in isolation. Comprehending how these factors simultaneously contribute to emotion regulation choice is important because social contexts are comprised by many factors that likely affect one another. For example, when considering intensity and reappraisal affordances simultaneously using vignettes, Suri et al. (2018) found that reappraisal affordances were significantly associated with emotion regulation choice but intensity was not. Whether this finding generalises across contexts is not yet known.

Overview of the present studies

We conducted three studies to address these gaps. In Study 1, we examined the relation between emotion regulation choice and participants' self-reported ratings of stimulus intensity, discrete emotions, and distraction and reappraisal affordances using images from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 1997). Study 2 replicated the procedures of Study 1 except that its images were drawn from the Nencki Affective Picture System (NAPS; Marchewka, Żurawski, Jednoróg, & Grabowska, 2014). This tested whether the results obtained in Study 1 were generalizable to another stimulus set and ensured that the results from Study 1 and past studies could not be attributed to covert factors such as image brightness and luminance (since the NAPS database is standardised for variables such as luminance and contrast). Study 3 tested whether the pattern of results in Study 1 and Study 2 would change if image ratings were obtained prior to participants making their emotion regulation choices as opposed to after it. Notably, our goal was not to determine which factors had the strongest relation with emotion regulation choice; rather, we were simply interested in which would emerge as significant predictors when considered simultaneously.

Study 1

Study 1 was divided into two parts separated by 1 week. During Part 1, the emotion regulation choice phase, participants viewed IAPS images and indicated whether distraction or reappraisal would best help them to manage their negative emotions. During Part 2, the ratings phase, participants viewed the same images from Part 1 and rated their intensity, the extent to which the images elicited discrete emotions, and provided distraction and reappraisal affordance ratings. We had participants provide emotion regulation choices *before* the image ratings because we wanted the images to be novel upon selecting between distraction and reappraisal (emotion regulation choices were

provided *after* the image ratings in Study 3). We used a week-long time lag between the phases in hopes of mitigating the attenuation of emotional responses (e.g. Fischer, Furmark, Wik, & Fredrikson, 2000; Fischer et al., 2003).

We then deployed a regression model that allowed us to consider the effects of these factors on emotion regulation choice simultaneously. Since intensity has consistently been linked to greater use of distraction (vs. reappraisal) in the context of images (e.g. Sheppes et al., 2011, 2014), we expected to replicate this link. Although reappraisal affordances had not yet been shown to be a unique predictor of emotion regulation choice in the context of images, we expected greater reappraisal affordances to be associated with greater use of reappraisal (vs. distraction) in line with our past work using vignettes (Suri et al., 2018). We had no specific predictions for whether discrete emotions or distraction affordances would be associated with emotion regulation choice.

Methods

Power analysis

As discussed in the introduction, investigations into the external factors of emotion regulation choice have primarily been done in isolation, precluding an understanding of their effect sizes when considered simultaneously with other factors. Using a methodological design similar to the present design, Shafir, Thiruchselvam, Suri, Gross, and Sheppes (2016) conducted a mixed-effects logistic regression (which is also the analysis we used) and found intensity was a significant predictor of emotion regulation choice with an odds ratio of 6.68 and a sample size of 25. No other external factors were investigated. According to G*Power (Faul, Erdfelder, Lang, & Buchner, 2007), we needed a sample size of 33 to obtain a significant effect on a single variable with an odds ratio of 4.0 for a standard logistic regression ($\alpha = .05$, $\beta = .80$), which is smaller than the 6.68 odds ratio obtained in Shafir et al. (2016). Thus, we reasoned that a sample size of 50 (double that of Shafir et al., 2016) would be sufficient to examine the relations between emotion regulation choice and each of our external factors. We further doubled this sample size anticipating participant attrition due to rigorous attention checks designed to ensure participant compliance with experimental instructions.

Participants

In order to obtain a sample large enough to examine the simultaneous effects of our proposed factors on emotion regulation choice, we recruited participants from Amazon's Mechanical Turk (Mturk; Berinsky, Huber, & Lenz, 2012). We reasoned that larger sample sizes afforded by this platform were important in our study design; further, we believed that we could, via rigorous attention checks, ensure that the quality of participant responses matched data obtained in the laboratory. Past emotion regulation choice findings, at least with respect to intensity, replicate within Mturk populations as they do in-person (e.g. Mehta, Young, Wicker, Barber, & Suri, 2017).

One hundred Mturk participants were recruited to complete the emotion regulation choice phase of the study (Part 1; Mean survey duration = 23 min). Participants were required to have completed at least 100 Human Intelligence Tasks (HITs) with at least a 95% approval rate and had not participated in any of our prior emotion regulation choice studies. Additionally, participants were paid $.50 for completing Part 1 and $3.50 for competing Part 2 to incentivise participants to complete both parts. After one week, those who completed Part 1 were contacted via the MTurkR package in R (Leeper, 2017) to notify them that Part 2 was available. Eighty-eight (aged 19–67, mean = 39, 43 males) of the initial 100 participants completed the ratings phase of the study (Part 2; Mean survey duration = 47 min). Only data from those who completed both phases were analyzed (i.e. $N = 88$).

Stimuli

Stimuli comprised images from the IAPS (Lang et al., 1997). Consistent with other emotion regulation choice studies (e.g. Mehta et al., 2017; Sheppes et al., 2011), we selected 15 low intensity images (normative mean intensity = 5.01; normative mean valence = 3.41) and 15 high intensity images (normative mean intensity = 6.12, normative mean valence = 1.99) based on normative ratings (see the Supplemental Materials available online for a complete list of the stimuli). Lower IAPS valence ratings reflect greater levels of negative emotion. The selected images were identical to those used in past emotion regulation choice studies (e.g. Shafir, Schwartz, Blechert, & Sheppes, 2015; Sheppes et al., 2011). Image content included car accidents, injury/mutilation, and distress.

Measures

Part 1: emotion regulation choice phase

Participants indicated (see Procedures below) which emotion regulation strategy (distraction vs. reappraisal) they felt would best help them to manage their negative emotions while viewing each image.

Part 2: ratings phase

Intensity. Participants rated the intensity of their negative emotional response while viewing each image (1 = *very low*, 9 = *very high*). In line with our grouping of low and high intensity images, high intensity images were rated as more intense than low intensity images ($p < .001$).

Discrete emotions. Participants indicated their level of experienced anger, disgust, fear, happiness, and sadness while viewing each image (0 = *not at all*, 8 = *very high*). We also included an "other" option if an emotion not listed was experienced, which was rated on the same scale. This item read "If other, please rate it and write in the emotion below." A text-box was provided to participants to report their "other" emotions.

Affordances. Participants provided a reappraisal affordance and distraction affordance rating for each of the 30 images. The reappraisal affordance item asked, "How easy was it to generate a reappraisal that reduced your negative emotions while viewing the image you just saw?" The distraction affordance item asked, "How easy was it to distract yourself in a way that reduced your negative emotions while viewing the image you just saw?" Each question was rated on a 9-point scale (1 = *very easy*, 9 = *very difficult*) and reverse scored so that higher scores represented greater affordances.

As helpfully pointed out by the reviewers of an earlier version of this paper, it was not clear if our reappraisal affordance item specifically assessed the latent construct of reappraisal affordances inherent in our stimuli or whether it actually assessed the subjective effort participants exerted to generate a reappraisal. Thus, we ran an additional study to address this concern, which can be found in the Supplemental Materials available online. The results of this study indicated that asking participants how easy it is to generate a reappraisal (our current operationalization) is essentially the same thing as asking participants the extent to which a stimulus facilitates the generation of a reappraisal (see the Supplemental Materials online for a more thorough discussion). Additionally, pilot studies of Suri et al. (2018) suggested that asking about reappraisal generation difficulty was more intuitive for participants. In these studies, participants tended to adopt an impersonal and theoretical view when asked to provide reappraisal affordance ratings via the extent to which a stimulus facilitates the generation of a reappraisal. Thus, based on these findings, and to remain consistent with the prior literature, we moved forward with the reappraisal affordance item that asked about reappraisal generation difficulty. We acknowledge, however, that there are various other ways to assess reappraisal affordances (e.g. measuring the quantity and quality of reappraisals for each stimulus).

Procedure

Participants began the emotion regulation choice phase by learning about reappraisal and distraction separately and in random order via text and an approximately 90 s instructional video.[1] Each video reviewed the definition of the target strategy and provided examples of how to use the strategy while viewing images that were representative of those shown during the experimental trials (one low intensity and one high intensity). The reappraisal text and video instructed participants to remain focused on the image for the entire duration and to use reappraisals that reinterpreted the image (Webb et al., 2012) such as thinking that help is on the way for an image depicting an injury. The text and video for distraction also instructed participants to remain focused on the image for the entire duration but to use active neutral distractions (Webb et al., 2012) such as thinking about something unrelated to the image (e.g. doing the laundry). Following the training of each strategy, participants practiced using the strategy they just learned while viewing one low intensity and one high intensity image (the images were the same across the distraction and reappraisal practice trials) and typed how they implemented the strategy in 1–2 sentences. These responses were later coded for whether the strategies were used correctly and those that were judged to have not used the strategies correctly across all four text entries (two for distraction, two for reappraisal) were removed from analyses.

Next, participants completed two practice trials (in addition to the emotion regulation strategy practice

trials) that mirrored the experimental trials of the emotion regulation choice phase prior to beginning the actual experimental trials, which were the canonical trials used in many emotion regulation choice experiments (e.g. Mehta et al., 2017; Sheppes et al., 2011). Each trial ($n = 30$; see top half of Figure 1) displayed an image in random order for 1 s. Participants were asked to select (via a mouse click) the emotion regulation strategy (distraction vs. reappraisal) that they felt would best help them to manage their negative emotions when they viewed the image a second time for 6 s.[2] Participants were instructed to look at the image and implement their selected strategy for the entire duration of the second viewing. After the second viewing of the image, participants were asked to indicate which emotion regulation strategy (distraction vs. reappraisal) they had selected to use during that trial as an attention check. Those that failed this attention check (i.e. reported using a strategy that did not match their initial choice) more than two times out of the 30 experimental trials were removed from analyses. The emotion regulation choice phase ended after completing each experimental trial.

The ratings phase (see bottom half of Figure 1) was completed 1 week later. Participants completed two practice trials before beginning the experimental trials. Each experimental trial had participants view an image that was displayed during the emotion regulation choice phase (in random order) for 6 s. Subsequently, participants rated the intensity of their negative emotional response to the image and the extent to which they experienced discrete emotions (described in the Measures section above). After providing intensity and discrete emotion ratings for each of the 30 images, they were randomly assigned to either a reappraisal affordance first group or a distraction affordance first group. The results were unaffected by this random assignment (as was the case in Study 2, which replicated the procedures of Study 1).

Those assigned to the reappraisal affordance first group reviewed reappraisal using the same text and video from the emotion regulation choice phase. Participants were then again shown each of the 30 images from the emotion regulation choice phase (in random order) for 6 s and provided a reappraisal affordance rating for each. They then reviewed how to use distraction using the same text and video from the emotion regulation choice phase and viewed each of the 30 images (in random order) for 6 s for a final time, providing a distraction affordance rating for each. Those in the distraction affordance first group simply switched the order in which they reviewed the emotion regulation strategies and provided affordance ratings.

Data analysis plan

We conducted a linear mixed-effects logistic regression (fully within-subjects) using the "glmer" function in the lme4 R package (Bates, Mächler, Bolker, & Walker,

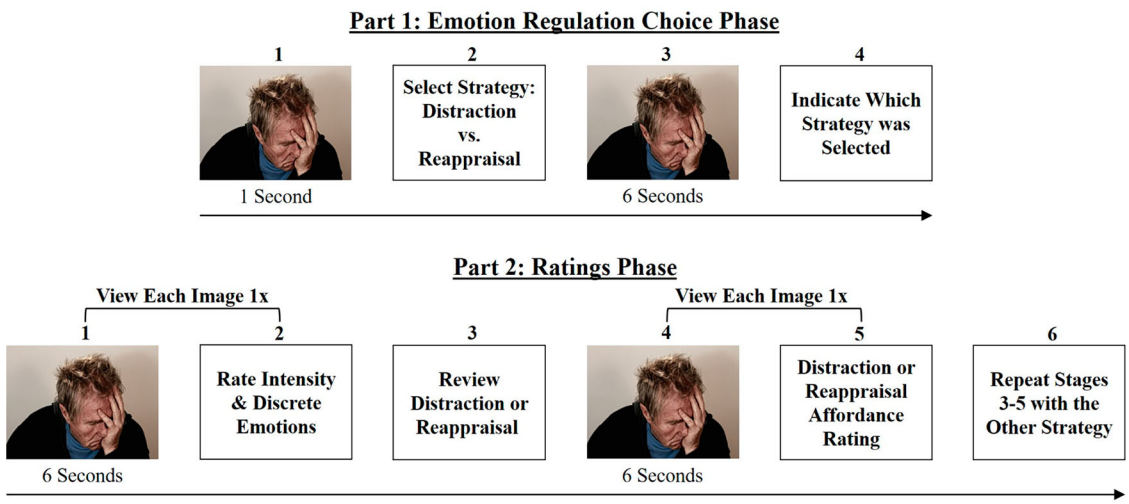

Figure 1. Procedures of the emotion regulation choice phase (Top) and ratings phase (Bottom) in Study 1 and Study 2. The image shown in this figure is representative of a low intensity image that was shown during the experimental trails but was not actually shown to participants.

2015). The dependent variable was emotion regulation choice (0 = distraction, 1 = reappraisal). Fixed effects were self-reported intensity, discrete emotion (anger, disgust, fear, happiness, sadness, "other"), and distraction and reappraisal affordance ratings. Only trials in which participants provided ratings across each of the fixed effects were considered in the model. We also assessed the variance inflated factor values (VIF) for each of our fixed effects as a measure of multicollinearity and if the VIFs were below 10, multicollinearity was not deemed to be a concern (Hair, Black, Babin, & Anderson, 2010).

Barr, Levy, Scheepers, and Tily (2013) state that linear mixed-effects models require a maximal random-effect structure (as justified by the experimental design) to control for the inflation of Type I error rates. Thus, to acquire maximal random-effect structure in the present study, we included by-participant and by-item (i.e. image) random intercepts (referred to as a random-intercept only model). The former accounted for the repeated measures design (i.e. violating independence across trials for a given participant) and the latter accounted for the independence violation resulting from the repeated presentation of each image (4x) (Barr et al., 2013). Due to our model not possessing a within-subjects manipulated fixed effect, we did not include by-participant or by-item random slopes.

Since we had no predictions for whether discrete emotions (anger, disgust, fear, happiness, sadness, "other") or distraction affordances were related to emotion regulation choice (7 total factors), the α level for these factors was set to .01 to provide a balance between controlling for Type-I and Type-II error rates. Bonferroni corrections reduce Type-I error rates but increase Type-II error rates, particularly when many comparisons are made (Benjamini & Hochberg, 1995). Since we predicted that reappraisal affordances and intensity would be significantly related to emotion regulation choice in line with past studies, we set their α levels to .05.

Results

Strategy practice trials and attention checks

Participants wrote how they used distraction and reappraisal to regulate their emotions during the strategy practice trials of the emotion regulation choice phase (two for each strategy for a total of four text entries). These responses were coded by two independent judges for whether the strategies were used correctly. Reliability was high for both distraction (κ = .88) and reappraisal (κ = .87) responses, and discrepancies were resolved through discussion among the judges. Participants who were judged to have used the strategies incorrectly across all four text entries were removed from analyses. This led to the removal of four participants (out of the 88 who completed both phases of the study). As an attention check, participants were also asked to select which strategy they used to regulate their emotions after viewing each image a second time during the emotion regulation choice phase. Seventeen participants failed this more than two times (out of 30 experimental trials) and were also removed from analyses.

The results described below were similar when the removed participants were included.

Main analyses

The final sample comprised 67 participants: 88 – 4 (incorrect distractions/reappraisals) – 17 (failed two attention checks) = 67. Additionally, 29.3% of the total trials did not possess a rating across each fixed effect (and were omitted in our model) because many participants did not provide a rating for the "other" discrete emotion item (10 participants did not provide a single response for the "other" emotion item). More specifically, among the entire sample, 94% of the missing data points across our fixed effects were specific to the "other" discrete emotion item. We return to this in the discussion section.

Descriptive statistics of the image ratings across low intensity, high intensity, and all images are displayed in Table 1 (see the Supplemental Materials available online for correlation matrices of the image ratings in each study; Image ratings at the item level (i.e. image) are also available online in the Supplemental Materials). The VIFs of our fixed effects were well below 10 (all VIFs < 1.94), indicating that multicollinearity was not an issue. Adding age and gender to the model did not change the results and they were not significantly associated with choice, so they will not be discussed further. The results of the mixed-effects logistic regression model are reported in Table 2.

In line with predictions and prior findings, reappraisal affordances were strongly associated with using reappraisal. Specifically, as reappraisal affordance ratings increased by one unit, participants were 1.11–1.34 times as likely to use reappraisal vs. distraction. In contrast, distraction affordances were not related to emotion regulation choice.

Table 1. Descriptive statistics of the image ratings in Study 1 and Study 2.

Image Group	Intensity *M* (*SD*)	Anger *M* (*SD*)	Disgust *M* (*SD*)	Fear *M* (*SD*)	Happy *M* (*SD*)	Sad *M* (*SD*)	"Other" *M* (*SD*)	DA *M* (*SD*)	RA *M* (*SD*)
Study 1									
Low Intensity	3.84 (2.21)	1.67 (2.25)	1.79 (2.51)	2.00 (2.42)	0.18 (0.78)	2.64 (2.58)	1.41 (2.45)	7.43 (1.97)	7.16 (1.98)
High Intensity	6.27 (2.46)	2.63 (2.75)	3.78 (3.10)	3.25 (2.93)	0.06 (0.32)	4.70 (2.78)	1.92 (2.91)	4.90 (2.74)	4.26 (2.64)
All Images	5.06 (2.64)	2.15 (2.56)	2.79 (2.99)	2.63 (2.75)	0.12 (0.60)	3.68 (2.87)	1.66 (2.70)	6.16 (2.70)	5.70 (2.75)
Study 2									
Low Intensity	4.52 (2.35)	1.43 (2.20)	1.28 (2.10)	1.96 (2.46)	0.33 (1.15)	3.94 (2.87)	0.63 (1.82)	6.83 (2.27)	6.79 (2.31)
High Intensity	5.85 (2.23)	2.61 (2.74)	3.32 (2.92)	2.69 (2.77)	0.22 (1.04)	4.54 (2.74)	0.70 (1.97)	5.56 (2.55)	4.98 (2.59)
All Images	5.19 (2.38)	2.02 (2.55)	2.30 (2.74)	2.33 (2.64)	0.28 (1.10)	4.24 (2.82)	0.66 (1.90)	6.20 (2.49)	5.88 (2.61)

Note. Happy = Happiness; Sad = Sadness; "Other" = Other emotions; DA = Distraction Affordances; RA = Reappraisal Affordances. All ratings are coded so that higher values represent higher levels of that factor.

Table 2. Study 1: Results of the mixed-effects logistic regression predicting emotion regulation choice (0 = Distraction, 1 = Reappraisal).

	B	Exp(*B*)	Exp(*B*) 95% CI	*Z* Value	*Pr*(>|*z*|)
Intercept	−.79	.45	0.14, 1.49	−1.30	.194
Intensity	−.15	.86	0.76, 0.98	−2.26	.024*
Anger	.06	1.06	0.96, 1.17	1.21	.226
Disgust	−.12	.89	0.81, 0.97	−2.70	.007*
Fear	−.02	.98	0.89, 1.08	−.44	.662
Happiness	.09	1.09	0.77, 1.54	.49	.628
Sadness	.05	1.05	0.96, 1.16	1.09	.278
"Other" Emotions	.10	1.11	1.01, 1.21	2.28	.023
Distraction Affordances	.07	1.08	0.97, 1.20	1.44	.151
Reappraisal Affordances	.20	1.22	1.11, 1.34	4.30	<.001*
Models Including All Factors Except for Distraction or Reappraisal Affordances^					
Distraction Affordances	.16	1.18	1.07, 1.30	3.26	.001*
Reappraisal Affordances	.22	1.25	1.15, 1.36	5.19	<.001*

Note. Exp(*B*) = Odds Ratio.

Due to not having specific predictions, Anger, Disgust, Fear, Happiness, Sadness, "Other" Emotions, and Distraction Affordances required a *p*-value of less than .01 to be considered significant.

^The statistics for distraction affordances represent results obtained from a model in which all factors EXCEPT reappraisal affordances were included. The statistics for reappraisal affordances represent results obtained from a model in which all factors EXCEPT distraction affordances were included. Both affordance items were significantly associated with greater reappraisal use in these separate models.

*Significantly associated with emotion regulation choice.

Also, in line with predictions and prior findings, intensity was associated with using distraction, indicating that participants were .76 to .98 times as likely to use reappraisal compared to distraction as intensity ratings increased by one unit. Demonstrated for the first time, the experience of disgust was associated with using distraction such that participants were .81 to .97 times as likely to use as reappraisal vs. distraction as disgust ratings increased by one unit. No additional discrete emotions were associated with emotion regulation choice.

Discussion

Study 1 addressed important gaps in the emotion regulation choice literature by revealing that, within the context of images, both (self-reported) reappraisal affordances and intensity were significant predictors of choice when considered simultaneously and in combination with discrete emotions and distraction affordances. Suri et al. (2018) found that reappraisal affordances, but not intensity, were significantly associated with emotion regulation choice when considered simultaneously using vignettes. Additionally, since reappraisal affordances had only been tied to emotion regulation choice with vignettes (Suri et al., 2018), we demonstrated for the first time that the predictive power of reappraisal affordances holds with pictorial stimuli. Finally, we found that greater self-reported disgust was associated with more distraction whereas other discrete emotions and distraction affordances were not associated with emotion regulation choice.

As shown in the correlation matrix of our factors in Study 1 (available online in the Supplementary

Materials), our distraction and reappraisal affordance items were strongly correlated ($r = .71$). This suggested that images that were easier to distract from were also easier to reappraise. Despite the VIFs indicating that multicollinearity was not an issue, we also ran a model in which all factors were included except for the reappraisal affordance item and another model in which all factors were included except for the distraction affordance item. This allowed us to examine whether the non-significant relation between distraction affordances and choice, and the significant relation between reappraisal affordances and choice, were an artifact of their shared variance or reflected a true pattern. As reported at the bottom of Table 2, distraction affordances were significantly associated with greater *reappraisal* use when reappraisal affordances were omitted from the model, and reappraisal affordances remained associated with greater reappraisal use when distraction affordances were omitted from the model. The effects of the other factors were unaffected in these models compared to the main results reported in Table 2. However, with respect to whether distraction affordances were related to choice, we were hesitant to draw firm conclusions from this single study because (1) distraction affordances were not significantly related to choice when reappraisal affordances were considered and (2) many experimental trials were omitted in our models due to missing data points. Therefore, we also tested these additional models in Study 2 and Study 3.

There were some important limitations in Study 1. First, it remains unclear if the present results can be obtained using an image database other than the IAPS because, just as every emotion regulation choice study up to this point, we relied on the IAPS for negative images. Since the IAPS dataset does not control for physical properties such as stimulus brightness and luminance, it is possible that controlling for these factors would yield a different choice pattern. Second, our "other" discrete emotion item was responsible for the exclusion of many experimental trials in our model (29.3%) because participants did not frequently provide a response for this item. We believed this may have occurred because of the way the item was worded. Participants were provided with the following text for the "other" emotion item: "If other, please rate it and write it in below." Such wording could have been interpreted as an optional question despite us wanting participants to provide a "0" rating if they did not experience "other" emotions.

We addressed these limitations in Study 2 by replicating the procedures of Study 1 using images from the Nencki Affective Picture System (NAPS; Marchewka et al., 2014) to provide empirical support for the generalization of our findings to another image database. Compared to the IAPS, the NAPS, in addition to intensity and valence, provide normative ratings for the physical properties of luminance, contrast, and entropy, allowing us to control factors that cannot be controlled for when using IAPS images. In other words, if the results from Study 2 replicated Study 1, we could conclude that Study 1 and past studies that used low and high intensity IAPS images to investigate the factors of emotion regulation choice were not confounded by differences among the physical properties of the images. Additionally, we changed the wording of the "other" emotion item to remove any potential ambiguity and to improve response rates and statistical power in our model.

Study 2: methods

Participants

One hundred Mturk participants were again recruited to complete the emotion regulation choice phase (Part 1; Mean survey duration = 24 min). The eligibility requirements and payment and recruitment methods were the same as Study 1. Ninety participants (aged 20-73, mean = 35, 50 males) of this initial pool of 100 completed the ratings phase (Part 2; Mean survey duration = 48 min) approximately one week later. Only data from those who completed both phases were analyzed (i.e. $N = 90$).

Stimuli

Based on normative ratings, 15 low intensity (normative mean intensity = 6.38, normative mean valence = 3.41) and 15 high intensity (normative mean intensity = 7.15, normative mean valence = 2.10) images from the NAPS database were selected for Study 2 (see the Supplemental Materials available online for a complete list of the stimuli). As in the IAPS, lower NAPS valence ratings reflect greater levels of negative emotion. The NAPS are divided into five categories (people, faces, animals, objects, and landscapes), include both positive and negative images within these categories, and have standardised ratings for intensity, valence, and approach-avoidance. Additionally, physical properties of the images are also

reported on dimensions of luminance, contrast, and entropy. The low intensity and high intensity images used in Study 2 did not differ on luminance, contrast, or entropy (all p's > .109). The NAPS images used in Study 2 contained content that was similar to the IAPS images used in Study 1.

As in Study 1, the high intensity images were rated as more intense than the low intensity images ($p < .001$).

Measures

Participants again provided discrete emotion ratings by indicating how much they experienced anger, disgust, fear, happiness, sadness, and "other" emotions (0 = *not at all*, 8 = *very high*). The wording for the "other" item, however, was changed to: "Other emotions not listed (If rating > 0, please write in the emotion(s) below)." Changing the wording in this way was expected to increase the response rate so that participants would provide a "0" rating if they did not experience other emotions rather than leaving it blank.

All other measures from Study 1 were administered in the same way in Study 2.

Procedure

The procedures of Study 2 were the same as Study 1 (see Figure 1).

Data analysis plan

Our data analysis plan in Study 2 was the same as Study 1. We again had no specific predictions for whether discrete emotion ratings or distraction affordances would be associated with emotion regulation choice and therefore set their α levels to .01. Reappraisal affordances and intensity were again predicted to be significantly associated with choice and we therefore used an α level of .05 for these factors.

Results

Strategy practice trials and attention checks

Two independent judges again coded the text entries provided by participants during the distraction and reappraisal practice trials of the emotion regulation choice phase (i.e. how they regulated their emotions). Reliability for whether participants used distraction (κ = .88) and reappraisal (κ = .94) correctly was high, and disagreements were resolved through discussion among the judges. As in Study 1, those who were judged to have used the strategies incorrectly across all four text entries (2 for each regulation strategy) were removed from analyses. This led to the removal of eight participants. Additionally, 23 participants failed more than 2 attention checks during the emotion regulation choice phase (selected a strategy after the second viewing of the image that did not match their initial selection) and were removed from analyses.

The results described below were similar when all removed participants were included.

Main analyses

Unlike Study 1, a rating for each fixed effect was provided by all participants, including for the rephrased "other" emotion item. Thus, participants likely interpreted the "other" emotion item in Study 1 as optional. The final sample comprised 59 participants: 90 − 8 (incorrect distractions/reappraisals) − 23 (failed 2 attention checks) = 59.

The VIFs of our fixed effects were well below 10 (all VIFs < 2.01), indicating that multicollinearity was not an issue. Adding age and gender to the model revealed that age was associated with using reappraisal ($p = .040$) such that participants were 1.00–1.11 times as likely to use reappraisal vs. distraction as age increased by 1 year. Gender was not significantly related to emotion regulation choice. Additionally, as described below, the significance level of intensity was affected by the inclusion of age and gender. No other differences were observed.

Descriptive statistics of the image ratings across low intensity, high intensity, and all images are displayed in Table 1. The results of the mixed-effects logistic regression model (without age and gender) are reported in Table 3.

In line with Study 1, reappraisal affordances were strongly associated with reappraisal use. Specifically, participants were 1.24–1.46 times as likely to use reappraisal vs. distraction as reappraisal affordance ratings increased by one unit. Distraction affordances again failed to emerge as a significant predictor of emotion regulation choice. While intensity was significantly associated with distraction use in Study 1, the association in Study 2 was in the same direction but marginal ($p = .053$). The marginal association indicated that as intensity ratings increased by one unit, participants were .79–1.00 times as likely to use reappraisal

Table 3. Study 2: Results of the mixed-effects logistic regression predicting emotion regulation choice (0 = Distraction, 1 = Reappraisal).

	B	Exp(*B*)	Exp(*B*) 95% CI	*Z* Value	*Pr(>|z|)*
Intercept	−.84	.43	0.16, 1.19	5.20	.099
Intensity	−.11	.89	0.79, 1.00	−1.94	.053
Anger	.01	1.01	0.93, 1.10	.29	.771
Disgust	−.11	.89	0.82, 0.97	−2.69	.007*
Fear	.05	1.05	0.97, 1.13	1.14	.253
Happiness	.05	1.05	0.86, 1.31	.49	.624
Sadness	.00	1.00	0.92, 1.09	.03	.973
"Other" Emotions	−.01	.99	0.86, 1.13	−.20	.839
Distraction Affordances	−.03	.97	0.90, 1.06	−.63	.531
Reappraisal Affordances	.30	1.34	1.24, 1.46	7.49	<.001*
Models Including All Factors Except for Distraction or Reappraisal Affordances^					
Distraction Affordances	.07	1.07	0.99, 1.15	1.69	.090
Reappraisal Affordances	.29	1.33	1.24, 1.44	7.66	<.001*

Note. Exp(*B*) = Odds Ratio.

Due to not having specific predictions, Anger, Disgust, Fear, Happiness, Sadness, "Other" Emotions, and Distraction Affordances required a *p*-value of less than .01 to be considered significant.

^The statistics for distraction affordances represent results obtained from a model in which all factors EXCEPT reappraisal affordances were included. The statistics for reappraisal affordances represent results obtained from a model in which all factors EXCEPT distraction affordances were included. Reappraisal affordances, but not distraction affordances, were significantly associated with emotion regulation choice in these separate models.

*Significantly associated with emotion regulation choice.

compared to distraction. Intensity, however, was significantly associated with more distraction ($p = .033$) when age and gender were included in the model such that participants were .78 to .99 times as likely to use reappraisal vs. distraction as intensity ratings increased by one unit.

The experience of disgust was significantly associated with using distraction just as it was in Study 1. Participants were .82 to .97 times as likely to use reappraisal vs. distraction as disgust ratings increased by one unit. Each of the other discrete emotions were again not significantly related to emotion regulation choice.

Additional models

As in Study 1, distraction and reappraisal affordances were strongly correlated ($r = .65$), further suggesting that images that were easier to distract from were easier to reappraise. Therefore, to determine how each related to emotion regulation choice when collinearity among the two was not an issue (despite the VIFs suggesting that this was not problematic), we again ran two additional models: one in which all factors were included except for reappraisal affordances and another in which all factors were included except for distraction affordances. As reported at the bottom of Table 3, distraction affordances *were not* significantly associated with choice when reappraisal affordances were removed from the model. This is in inconsistent with the findings from Study 1, but consistent with the findings obtained when both affordance items were simultaneously considered in Study 1 and Study 2. Further, reappraisal affordances remained a significant and strong predictor of reappraisal use when distraction affordances were omitted from the model. The effects of the other factors (i.e. intensity, discrete emotions) were largely unchanged in these additional models.

Discussion

Study 2 aimed to replicate and enhance the generalizability of the findings from Study 1 by using the NAPS. In line with Study 1, we observed significant relations between emotion regulation choice and self-reported reappraisal affordances (but not distraction affordances), intensity (albeit marginal in Study 2), and disgust (but not other discrete emotions). Since the low and high intensity NAPS images used in Study 2 did not differ in luminance, contrast, or entropy, we concluded that these image properties were unlikely to have confounded Study 1 or past studies that used negative IAPS images to create low and high intensity image sets. Additionally, while distraction and reappraisal affordances were again strongly associated, the additional models that we ran in Study 2 (see bottom of Table 3) replicated the results of our main models. Specifically, reappraisal affordances, and not distraction affordances, were associated with the choice between distraction and reappraisal. We examined this in Study 3 as well.

While we importantly replicated our findings across Study 1 and Study 2, there were several key issues with

these studies that we addressed in Study 3.[3] First, it was not ideal that participants provided image ratings *after* their emotion regulation choices because it is not clear if these ratings are predictors or outcomes of emotion regulation choice. This procedure also meant that the ratings participants provided may have been influenced by the way they regulated their emotions during the initial viewing of the image. Although we chose this procedure to prevent participants' emotion regulation choices from being influenced by the repeated presentation of each image reducing their emotional reactions (Fischer et al., 2000, 2003), we are arguing that external factors are important predictors of emotion regulation choice. Thus, Study 3 had participants provide image ratings *before* their emotion regulation choices to bolster our confidence about the direction of these relations. The image ratings in Study 3, therefore, were provided in response to novel images and not affected by participants' prior emotion regulation choices. Second, our operationalization of distraction affordances in Study 1 and Study 2 was not equivalent to our operationalization of reappraisal affordances. Specifically, whereas our reappraisal affordance item focused on the generation process ("How easy was it to *generate a reappraisal* … "), our distraction affordance item did not ("How easy was it to distract yourself in a way … "). Since we specifically trained participants to use active neutral distractions (Webb et al., 2012) such as thinking about something unrelated to the image (e.g. doing the laundry), the generation of neutral thoughts might also be easy or difficult due to levels of distraction affordances. We equated these items in Study 3. Third, rather than having participants view each image four times—a cumbersome process that might have impacted participants' ratings—we simplified our design in Study 3 so that participants only viewed each image twice (once during the ratings phase and once during the emotion regulation choice phase). Fourth, each of our attention checks (strategy practice trial text entries, whether participants selected the strategy they said they were going to use) occurred during the emotion regulation choice phase. In other words, we did not have an attention check during the ratings phase. This was addressed in Study 3. Finally, our attention check in the emotion regulation choice phase pertaining to whether participants selected the strategy they said they were going to use could not determine if participants correctly implemented the strategy while they viewed the image for 6 s. Instead, this attention check simply assessed whether participants remembered the strategy they selected. Thus, in Study 3, we used an attention check that allowed us to determine if participants were correctly implementing their selected strategy.

Study 3

The primary goal of Study 3 was to determine if our results from Study 1 and Study 2 would replicate if image ratings were obtained prior to choice as opposed to after it. As noted above, we also made several changes to our methods to equate our reappraisal and distraction affordance items, simplify our procedure, and implement more rigorous attention checks.

Participants

One hundred Mturk participants were recruited to complete the ratings phase of this study (now Part 1 instead of Part 2; Mean survey duration = 30 min). Eligibility requirements and the payment and recruitment methods were the same as in Study 1 and Study 2. Eighty-nine participants (aged 23–71, mean = 36, 47 males) of this initial pool of 100 completed the emotion regulation choice phase (now Part 2 instead of Part 1; Mean survey duration = 27 min) approximately one week later. Only data from those who completed both phases were analyzed (i.e. $N = 89$).

Stimuli

Study 3 used the NAPS images from Study 2. The high intensity images were again rated as more intense than the low intensity images ($p < .001$).

Measures

All measures were the same as in Study 2 except for two changes. First, the reappraisal affordance and distraction affordance items were changed to the present tense since we had participants provide all image ratings at the same time in this study (see Procedure section below). Second, we equated the wording of the distraction affordance item with the reappraisal affordance item in terms of its focus on the generation process. Specifically, the new distraction affordance item asked, "How easy is it to generate distracting thoughts that reduce your negative emotions while viewing this image?" Each affordance item was rated on a 9-point scale (1 = *very easy*, 9 = *very difficult*) and

reverse scored so that higher scores represented greater affordances.

Procedure

Except for what is mentioned below, all procedures were the same as Study 1 and Study 2. Part 1 of this study was now the ratings phase instead of the emotion regulation choice phase (see top half of Figure 2). Just as participants did in the emotion regulation choice phase of Study 1 and Study 2, participants now practiced using distraction and reappraisal two times each after learning about them in random order via text and instructional videos during the ratings phase. Each practice trial concluded by having participants write how they used the strategy, and these responses were coded for comprehension. Those that were judged to have used the strategies incorrectly across all four text entries were removed from analyses. Additionally, the ratings phase in this study presented each image only once instead of three times because participants now viewed each image in random order and provided ratings of intensity, discrete emotions, and distraction and reappraisal affordances during the same viewing. The order of these items was randomised. Since participants made each of these ratings simultaneously, the image was now displayed until participants completed the ratings.

The emotion regulation choice phase, now Part 2 (see bottom half of Figure 2), was completed one week later. No procedural changes were made to this phase except that the attention check was adjusted. First, like the prior studies, participants indicated their preferred strategy (distraction vs. reappraisal) after viewing each image for 1 s. However, after the 6 s viewing of the image, there were four experimental trials in which participants were asked to write a description of how they regulated their emotions. This attention check allowed us to (1) see if the participant used the strategy they selected following the 1 s viewing of the image and (2) determine if the participant correctly used the strategy for the image that was shown during that trial. Participants who were judged to have failed more than 2 of these 4 attention checks were removed from analyses.

Data analysis plan

Our data analysis plan in Study 3 was the same as Study 1 and Study 2. As in the prior studies, an α level of .01 was used for discrete emotions and distraction affordances whereas we used an α level of .05 for reappraisal affordances and intensity.

Results

Strategy practice trials and attention checks

The text entries provided during the strategy practice trials of the ratings phase were coded for whether the strategies were used correctly by two independent

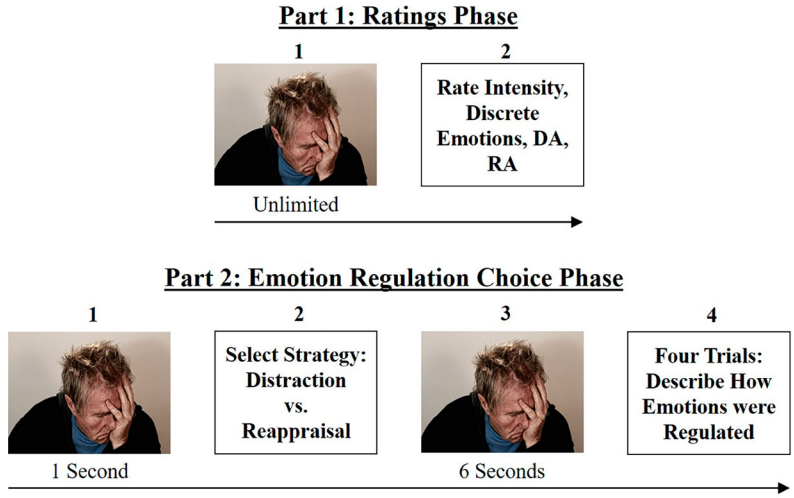

Figure 2. DA = Distraction Affordances, RA = Reappraisal Affordances. Procedures of the ratings phase (Top) and the emotion regulation choice phase (Bottom) in Study 3. The image shown in this figure is representative of a low intensity image that was shown during the experimental trails but was not actually shown to participants.

judges. Reliability for whether participants used distraction (κ = .91) and reappraisal (κ = .90) correctly was high, and disagreements were resolved through discussion among the judges. As in Study 1 and Study 2, participants who were judged to have used the strategies incorrectly across all four text entries (two for each strategy) were removed from analyses. This led to the removal of 26 participants. With respect to the emotion regulation choice phase attention check (whether participants' text entries matched their selected strategy and reflected correct use of the strategy for the image shown), reliability was high for whether participants failed this check (κ = .87). Twelve participants failed more than 2 of these attention checks and were also removed from analyses.

Two small differences (described below) were observed between the results that were obtained after removing participants and the results obtained when no participants were removed.

Main analyses

All experimental trials were included in our model because a rating for each fixed effect was provided across all participants. The final sample comprised 51 participants: 89 – 26 (incorrect distractions/reappraisals during the ratings phase) – 12 (failed more than 2 emotion regulation choice phase attention checks) = 51.

Multicollinearity was also not an issue in this study (all VIFs < 2.40). The descriptive statistics of the image ratings are displayed in Table 4. Adding age and gender into the model did not affect the results and neither were associated with emotion regulation choice, so they will not be discussed further. The results of the mixed-effects logistic regression model are reported in Table 5.

Replicating Study 1 and Study 2, reappraisal affordances were significantly associated with using reappraisal such that participants were 1.01–1.21 times

Table 4. Descriptive statistics of the image ratings in Study 3.

Image Group	Intensity *M* (*SD*)	Anger *M* (*SD*)	Disgust *M* (*SD*)	Fear *M* (*SD*)	Happy *M* (*SD*)	Sad *M* (*SD*)	"Other" *M* (*SD*)	DA *M* (*SD*)	RA *M* (*SD*)
Low Intensity	3.82 (2.37)	1.27 (2.12)	1.38 (2.21)	1.94 (2.55)	0.28 (0.99)	3.38 (2.92)	0.35 (1.34)	6.44 (2.48)	6.68 (2.48)
High Intensity	5.49 (2.50)	2.52 (2.81)	3.45 (3.01)	2.81 (2.92)	0.20 (0.80)	4.19 (2.91)	0.38 (1.34)	5.11 (2.63)	4.89 (2.66)
All Images	4.65 (2.57)	1.90 (2.56)	2.41 (2.83)	2.37 (2.78)	0.24 (0.90)	3.78 (2.95)	0.37 (1.34)	5.77 (2.64)	5.78 (2.72)

Note. Happy = Happiness; Sad = Sadness; "Other" = Other emotions; DA = Distraction Affordances; RA = Reappraisal Affordances. All ratings are coded so that higher values represent higher levels of that factor.

Table 5. Study 3: Results of the mixed-effects logistic regression predicting emotion regulation choice (0 = Distraction, 1 = Reappraisal).

	B	Exp(*B*)	Exp(*B*) 95% CI	*Z* Value	*Pr(>|z|)*
Intercept	.17	1.19	0.39, 3.58	.31	.756
Intensity	−.10	.90	0.81, 1.01	−1.78	.074
Anger	−.07	.93	0.85, 1.02	−1.52	.128
Disgust	−.13	.88	0.80, 0.95	−3.06	.002*
Fear	.07	1.07	0.99, 1.16	1.71	.087
Happiness	.23	1.26	1.04, 1.56	2.25	.025
Sadness	.07	1.08	1.00, 1.16	1.91	.056
"Other" Emotions	−.03	.97	0.86, 1.09	−.55	.585
Distraction Affordances	−.03	.97	0.88, 1.07	−.62	.535
Reappraisal Affordances	.10	1.11	1.01, 1.21	2.27	.023*
Models Including All Factors Except for Distraction or Reappraisal Affordances^					
Distraction Affordances	.02	1.02	0.93, 1.11	.39	.697
Reappraisal Affordances	.09	1.10	1.01, 1.18	2.22	.026*

Note. Exp(*B*) = Odds Ratio.

Due to not having specific predictions, Anger, Disgust, Fear, Happiness, Sadness, "Other" Emotions, and Distraction Affordances required a *p*-value of less than .01 to be considered significant.

^The statistics for distraction affordances represent results obtained from a model in which all factors EXCEPT reappraisal affordances were included. The statistics for reappraisal affordances represent results obtained from a model in which all factors EXCEPT distraction affordances were included. Reappraisal affordances, but not distraction affordances, were significantly associated with emotion regulation choice in these separate models.

*Significantly associated with emotion regulation choice.

as likely to use reappraisal vs. distraction as reappraisal affordance ratings increased by one unit. Using an operationalization that was equivalent to our reappraisal affordance item, distraction affordances were once again not related to emotion regulation choice. Intensity was marginally associated with using distraction ($p = .074$) in this study. Specifically, participants were .81–1.01 times as likely to use reappraisal vs. distraction as intensity ratings increased by one unit. This replicates Study 2 but not Study 1 because the association was significant in that study. Yet again, the experience of disgust (but not other discrete emotions) was a significant predictor of emotion regulation choice such that participants were .80 to .95 times as likely to use reappraisal vs. distraction as disgust ratings increased by one unit.

As mentioned above, there were two differences in the results when no participants were removed. First, including all participants resulted in intensity being *significantly* (instead of marginally) associated with more distraction ($p = .033$) such that participants were .85 to .99 times as likely to use reappraisal vs. distraction as intensity ratings increased by one unit. Second, and interestingly, the experience of happiness was significantly associated with reappraisal ($p = .002$) when no participants were removed. Specifically, participants were 1.04–1.20 times as likely to use reappraisal vs. distraction as happiness ratings increased by one unit. We are hesitant, however, to view this as a conclusive finding since happiness ratings were unrelated to choice in Study 1 and Study 2. All other relations with emotion regulation choice remained the same in terms of significance levels.

Additional models

Distraction and reappraisal affordances were again strongly associated in Study 3 ($r = .90$). As in Study 1 and Study 2, we ran separate models to examine the extent to which each were associated with choice when the other was omitted from the model. As displayed at the bottom of Table 5, the effects of distraction and reappraisal affordances were unchanged after excluding the other from the model. Specifically, distraction affordances remained unassociated with choice when reappraisal affordances were not considered whereas reappraisal affordances remained associated with greater reappraisal use when distraction affordances were not considered. Compared to our main model, the effects of our other factors (i.e. intensity, discrete emotions) remained the same in these separate models.

Discussion

In general, Study 3 importantly replicated our findings from Study 1 and Study 2 while addressing several methodological concerns. First, with respect to replication, we again observed significant relations between emotion regulation choice and self-reported reappraisal affordance and disgust ratings. Self-reported intensity was in the expected direction but marginally related to emotion regulation choice. Second, this study had participants provide image ratings *before* their emotion regulation choices, suggesting that our external factors are likely key predictors of emotion regulation choice. The novelty of the image upon making either image ratings or emotion regulation choices did not affect the results since both forms of our procedure produced similar findings. Third, by observing another non-significant relation between emotion regulation choice and self-reported distraction affordances after changing the wording to reflect the process of generating neutral thoughts (in line with our reappraisal affordance question and the way we trained participants to use distraction), distraction affordances, in terms of our operationalizations, appear to be inconsequential for emotion regulation choice. The additional models that were run in Study 3 provided further evidence that it is reappraisal affordances, and not distraction affordances, that influence emotion regulation choice. Fourth, our attention checks in this study were more rigorous because we had attention checks in both study phases and the check in the emotion regulation choice phase allowed us to determine whether participants correctly implemented their selected strategy during several experimental trials.

General discussion

The current studies were the first to (1) examine the relative contributions of emotional intensity and reappraisal affordances on emotion regulation choice simultaneously using pictorial stimuli and (2) explore the predictive power of discrete emotions and distraction affordances for choice. Study 1 used a standardised image set that has been exclusively used to study emotion regulation choice with negative images (IAPS) and Study 2 was a replication of Study 1 except that we utilised a different standardised image database (NAPS) to enhance the generalizability of our findings and rule out the possibility that physical property differences (luminance, contrast,

entropy) between negative low and high intensity IAPS images confounded Study 1 and past studies. Study 3 addressed several Study 1 and Study 2 methodological concerns, enhancing our confidence in the conclusions drawn from our studies. Additionally, our goal was not to examine which of our factors had the strongest effect on emotion regulation choice; rather we simply wanted to examine which of them emerged as significant predictors.

External factors of emotion regulation choice

In line with predictions and past studies (e.g. Sheppes et al., 2011, 2014), higher self-reported intensity was associated with less reappraisal and more distraction in our studies, but the relation was marginal in Study 2 and Study 3 (both $ps < .075$). Interestingly, when studied in isolation using images, intensity has been found to be a very strong predictor of emotion regulation choice (e.g. Sheppes et al., 2011, 2014). Our findings, therefore, suggest that the relation between intensity and emotion regulation choice may be affected by the inclusion of reappraisal affordances. For example, Suri et al. (2018) found that intensity *was not* related to emotion regulation choice when reappraisal affordances were considered using vignettes, and intensity was a significant predictor of emotion regulation choice in each of our studies when we omitted reappraisal affordances from the model (all $ps < .016$). Further examining the simultaneous contributions of intensity and reappraisal affordances for choice is an important direction for future research.

As predicted, greater self-reported reappraisal affordances were strongly linked with more reappraisal and less distraction in each of our studies. We extended and generalised the findings of Suri et al. (2018) by demonstrating the effect of reappraisal affordances on emotion regulation choice in the context of images. The current findings are also in line with studies that provided participants with reappraisals they could use (Sheppes et al., 2014, Study 2; Suri, Whittaker, et al., 2015, Study 3). These studies found that participants generally used reappraisal more often when they were given an applicable reappraisal compared to conditions in which a reappraisal was not provided. Despite a similar pattern of findings, it is not clear if an experimenter generated reappraisal can be as effective for downregulating emotions as a participant generated reappraisal, or if the factors (or the size of their effects) that influence emotion regulation choice depend on whether they are self-reported or experimentally manipulated. This latter point seems particularly interesting for future research to investigate.

On another note, as shown in the correlation matrices for each study as part of the Supplemental Materials available online, reappraisal affordances were significantly and negatively associated with the endorsement of each discrete emotion across all studies (rs ranged from −.29 to −.47) except for happiness and "other" emotions, which were not significantly related to reappraisal affordances across each study (rs ranged from −.06 to −.20). This suggested that reappraisal affordances may be low in contexts of intense discrete emotions (in addition to general intensity). Still, reappraisal affordances in our studies were self-reported, precluding an understanding of the stimulus qualities that contribute to this construct. Future studies should continue to build upon our understanding of reappraisal affordances by moving beyond self-report to more objective measures.

In contrast, self-reported distraction affordances (using different operationalizations) were not associated with emotion regulation choice in the current studies. Although some stimuli are inherently more salient than others (e.g. positive vs. negative stimuli; Smith et al., 2003) and therefore may possess varying levels of distraction affordances, we believe that the non-significant findings may make sense given past findings and theory. Regardless of emotional intensity, distraction is effective at down regulating emotions because it is an early selection strategy that is implemented before emotional information is represented in working memory (Sheppes & Gross, 2011; Sheppes et al., 2014). Thus, distraction affordances might not be particularly influential of emotion regulation choice since distraction can typically be implemented effectively across most situations, but this conclusion requires further empirical investigation. As noted in each study, however, our distraction affordance and reappraisal affordance items were strongly correlated (Study 1 $r = .71$; Study 2 $r = .65$; Study 3 $r = .90$), particularly in Study 3 after we equated the wording of the two items so that each focused on the generation process. These associations indicated that images that were easier to distract from were also easier to reappraise. We fully acknowledge that our studies cannot elucidate the exact source of this covariation, nor do we know if distraction affordances are related to stimulus intensity or salience, and/or whether they include a subjective measure of effort.

To ensure that our main findings were not an artifact of the collinearity between distraction and reappraisal affordances, we ran, for each study, a model in which we included all factors except for reappraisal affordances and another model in which we included all factors except for distraction affordances. These additional models (Table 2 for Study 1, Table 3 for Study 2, Table 5 for Study 3) revealed that distraction affordances were significantly related to greater *reappraisal* use in Study 1, but not related to choice in Study 2 or Study 3. In contrast, reappraisal affordances remained significantly associated with greater reappraisal use in all studies. Compared to each of the full models, the effects of the other factors (i.e. intensity, discrete emotions) were not impacted in these additional models. Future studies should attempt to empirically distinguish between distraction and reappraisal affordances and provide further evidence that it is reappraisal affordances, and not distraction affordances, that are important for emotion regulation choice, at least with respect to choosing between distraction and reappraisal.

Although emotion type of the vignettes (anger vs. disgust) did not predict emotion regulation choice in Suri et al. (2018), reappraisal was generally chosen more often among the anger vignettes whereas distraction was more frequently chosen for the disgust vignettes. Indeed, across each of our studies, a greater experience of self-reported disgust was associated with more distraction and less reappraisal. It is notable that disgust was associated with distraction in models that accounted for reappraisal affordances because, despite their covariation ($rs > -.33$ across all studies), it suggests that there are other properties of disgust that lead individuals to use distraction. Perhaps individuals develop high action readiness (Suri, Sheppes, & Gross, 2015) over their lifetime to use distraction or avoidance-based strategies in response to disgust because of its sensory and simple appraisal profile (Lazarus, 1991). Such an explanation is speculative but worth investigating in future studies. However, anger and the other emotions that were self-reported (sadness, fear, happiness, "other") were not significantly related to choice in our studies. Though, it is possible that our chosen stimuli might have constrained the range of ratings for some of the discrete emotions, resulting in low power. However, the number of images that received ratings greater than 0 for disgust, anger, fear, sadness, and "other" was comparable (see the Supplementary Materials online for by-image descriptive statistics in each study). Happiness ratings above 0 were uncommon across our studies, but this was expected since our images were negatively valenced.

Implications of the current findings

Since the NAPS images in Study 2 and Study 3 did not differ on luminance, contrast, or entropy, and we largely replicated the findings that were obtained using IAPS images in Study 1, we concluded that physical property differences within low and high intensity IAPS images likely did not confound our results in Study 1 or past studies that have used negative IAPS images. Additionally, by having participants provide image ratings before their emotion regulation choices in Study 3 (unlike Study 1 and Study 2 which had participants provide image ratings after their emotion regulation choices), we can more confidently say that intensity, reappraisal affordances, and disgust are likely important *predictors* (factors) of emotion regulation choice, at least when they are self-reported. Relatedly, the novelty of the image upon providing image ratings or emotion regulation choices did not appear to affect our results.

By largely replicating our findings across three studies, our results strengthen the account that emotion regulation, like other motivated decisions, is likely influenced by myriad of factors. People might choose emotion regulation strategies out of habit (e.g. use distraction when experiencing disgust), just as they do in many other domains (Ghafur, Suri, & Gross, 2018). For example, Watkins and Nolen-Hoeksema (2014) hypothesise that depressive rumination can become habitual and automatically triggered by contextual factors (e.g. location, mood), suggesting this might also hold true for other emotion regulation strategies. Emotion regulation choice might also be susceptible to the amount of devoted attention to the situation and stimulus (Ghafur et al., 2018) or levels of action readiness related to the implementation of particular regulation strategies (Suri, Sheppes, et al., 2015). Relatedly, the results of the current studies have the potential to extend the emotion regulation choice framework of Sheppes et al. (2014). Specifically, our findings suggest that, in addition to intensity and temporal engagement, reappraisal affordances may also help to determine when reappraisal is effective. Perhaps stimuli with high reappraisal affordances may be effectively reappraised despite late engagement, and independent of their intensity.

Limitations

We discuss three limitations and partial mitigations of the present work. The limitations are related to the participant pool, stimuli, and study design.

First, our decision to use Mturk participants prevents us from generalizing our results to different populations because Mturk participants tend to differ from community and student samples on some demographic characteristics (Goodman, Cryder, & Cheema, 2013). However, Mturk participants can be more representative of the U.S. population compared to some in-person convenience samples (Berinsky et al., 2012). Still, Mturk participants were preferable for the present studies because we were able to easily obtain sample sizes large enough to examine the effects of several different external factors simultaneously. Under controlled circumstances, Mturk participants can provide high-quality data (Buhrmester, Kwang, & Gosling, 2011) and replications of important published results have been obtained with Mturk participants (Berinsky et al., 2012), including findings pertaining to intensity and emotion regulation choice (Mehta et al., 2017). Thus, given our rigorous attention checks to identify those who failed to follow instructions, and our replication of intensity, reappraisal affordance, and disgust effects across three studies, our concerns regarding our participant pool were partially mitigated.

Second, although we replicated our findings using different standardised image sets, we are unable to generalise our results to other types of stimuli (e.g. film clips, vignettes). Up to this point, images, particularly from the IAPS, have been the primary type of stimuli used in emotion regulation choice experiments (cf. Suri et al., 2018). We importantly demonstrated in Study 2 and Study 3 that our results generalised to another image database, the NAPS, but the NAPS, too, is pictorial stimuli. Nevertheless, we cannot rule out the possibility that our results are unique to images and may not generalise to other types of stimuli.

Another limitation concerns our methodological design, which also applies to all emotion regulation choice studies that have utilised a version of the current methods (e.g. Mehta et al., 2017; Sheppes et al., 2011). We showed images to participants for 1 s and then asked them to select the strategy that they felt would best help them to manage their negative emotions when they viewed the image again. Real-world situations do not always afford the opportunity to prepare and decide which strategy we want to use, nor do they restrict us to only two strategies. Events often happen quickly, requiring us to select a strategy right away. Thus, the present findings might not generalise to situations in which participants are not shown the stimuli beforehand, a procedure that, due to sequential effects, has been found to influence emotion regulation choices as well (Murphy & Young, 2018). Self-report might have also biased participants' emotion regulation choices and ratings since some factors might afford greater internal access than others. Nevertheless, the present studies crucially point to a pool of factors that appear to influence our emotion regulation choices.

Concluding comment

Given the profound consequences of emotion regulation choice, we believe that it is crucial to continue to broaden our understanding of the factors that influence such choices. Future work could productively generalise the present findings to other types of stimuli such as film clips, vignettes, or real-world situations. It may also be important to examine whether external factors of emotion regulation choice are consistent across cultures since gathering evidence suggests that culture may play a role. For example, Matsumoto (1990) found that both American and Japanese participants differed in their ratings of which emotions were appropriate to display with different groups of people. Relatedly, Mehta et al. (2017) found that Americans and Indians elected to use different emotion regulation strategies across the same contexts. These types of findings suggest that we have much more work to do to understand the various factors that contribute to emotion regulation choice.

Notes

1. Each of these videos are provided in the Supplemental Material available online.
2. The initial and second viewing length of each image (1 and 6 s, respectively) were not identical to past in-lab studies using our design (500 and 5000 ms, respectively; e.g., Sheppes et al., 2011, 2014) because some online participants have reported an inability to see the image during the initial viewing, presumably because of computer or internet speed. Slightly increasing the viewing duration helped to eliminate this problem.
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